PROCEEDINGS

OF THE

SCIENTIFIC MEETINGS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.

January 7, 1873.

R. Hudson, Esq., F.R.S., V.P., in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of December 1872 :—

The total number of registered additions to the Society's Menagerie during the month of December, 1872, was 59, of which 6 were by birth, 17 by presentation, 29 by purchase, and 7 were received on deposit. The total number of departures during the same period by death and removals was 95.

The most noticeable additions during the month of December were as follows :—

1. A small Gavial (*Gavialis gangeticus*, Gm.), presented Dec. 11th by Dr. John Anderson, F.Z.S., Director of the Indian Museum, Calcutta, being the first example of this Crocodilian received alive by the Society.

2. An Indian Badger (*Arctonyx*), presented on the same day by Lieut.-Col. Hildebrand, of Kyouk Phyoo. This specimen is much smaller in size than the example of *Arctonyx collaris* presented by Dr. John Anderson in August 1867*, and otherwise slightly different. It seems, however, to be a young animal. If it turn out to be distinct, I think it may be referable to *Arctonyx taxoides*, Blyth, J. A. S. B. xxii. p. 591 (1853), if this species be really distinguishable.

3. A Red Tiger Cat (*Felis planiceps*), purchased of a London dealer, December 14th. This species somewhat resembles the Golden Tiger Cat (*Felis moormensis*), of which we have two fine living specimens, but is immediately distinguishable by its smaller size, and very short tail. I have never previously seen a living example of it. It was first described by Vigors and Horsfield in the third volume of the 'Zoological Journal' (p. 449), from Sumatran specimens obtained by Sir Stamford Raffles. The present example is probably from Malacca.

* See P. Z. S. 1867, p. 821.

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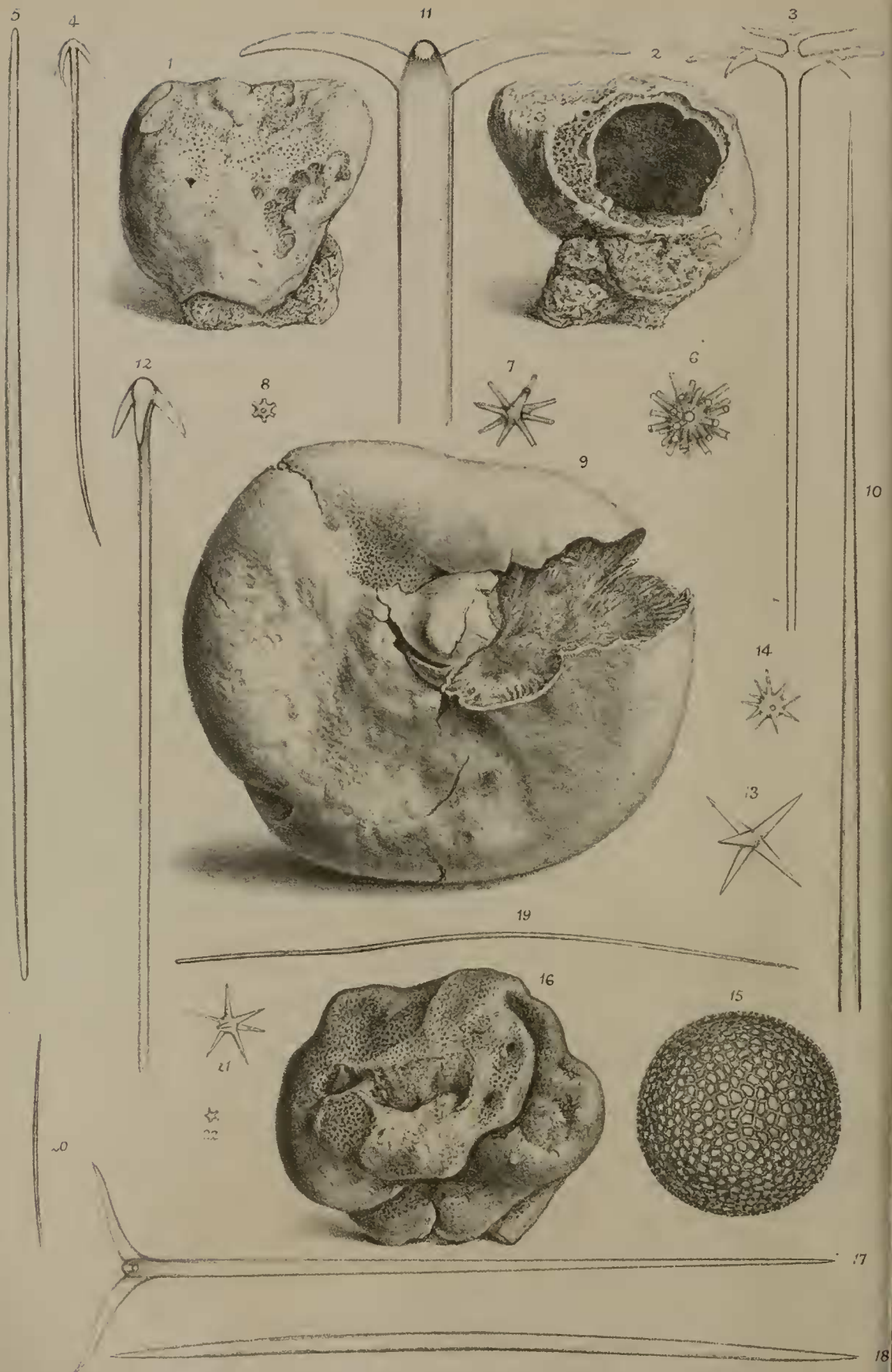
4. A specimen of the Eyra Cat (*Felis eyra*), purchased Dec. 28th, along with other animals, all stated to have been brought from Maranham, Brazil. This beautiful species is rare in living collections; but we have received it alive on at least two previous occasions *.

5. An example of the American Darter (*Plotus anhinga*, Linn.), in immature plumage, received in the same collection from Maranham. I am not aware that any example of this singular pelecanoid form has

American Darter.

been previously brought to this country alive. In the mode in which the bird sits up, as will be seen by the accompanying sketch, it is very

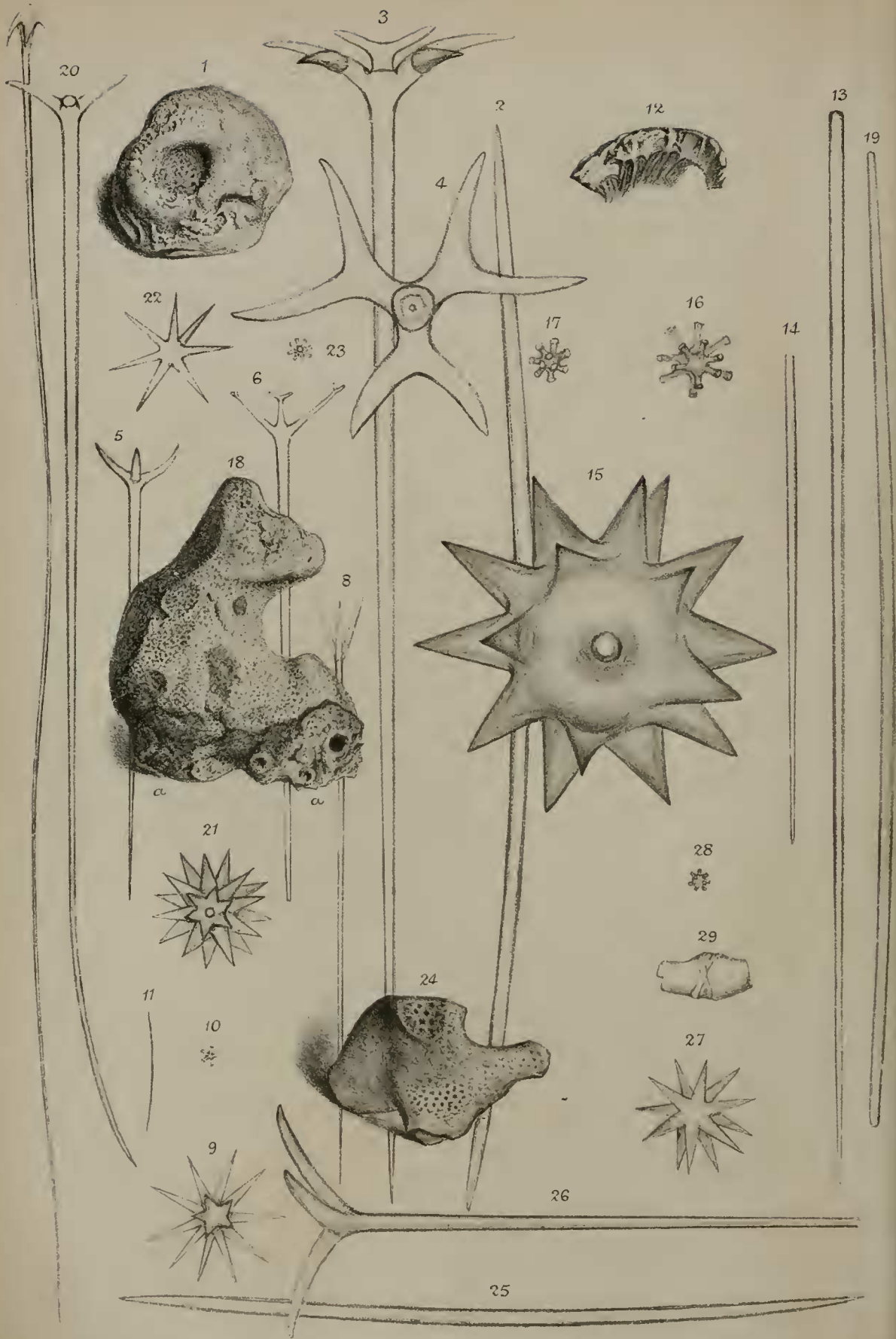
* See Zool. Sketches, vol. i. pl. 6, and Rev. List of Vert. p. 40.



Geodia Flemingii 1–8, G. depressa 9–15. G gibberosa 16–22.

W. Lens Aldous del. et lith.

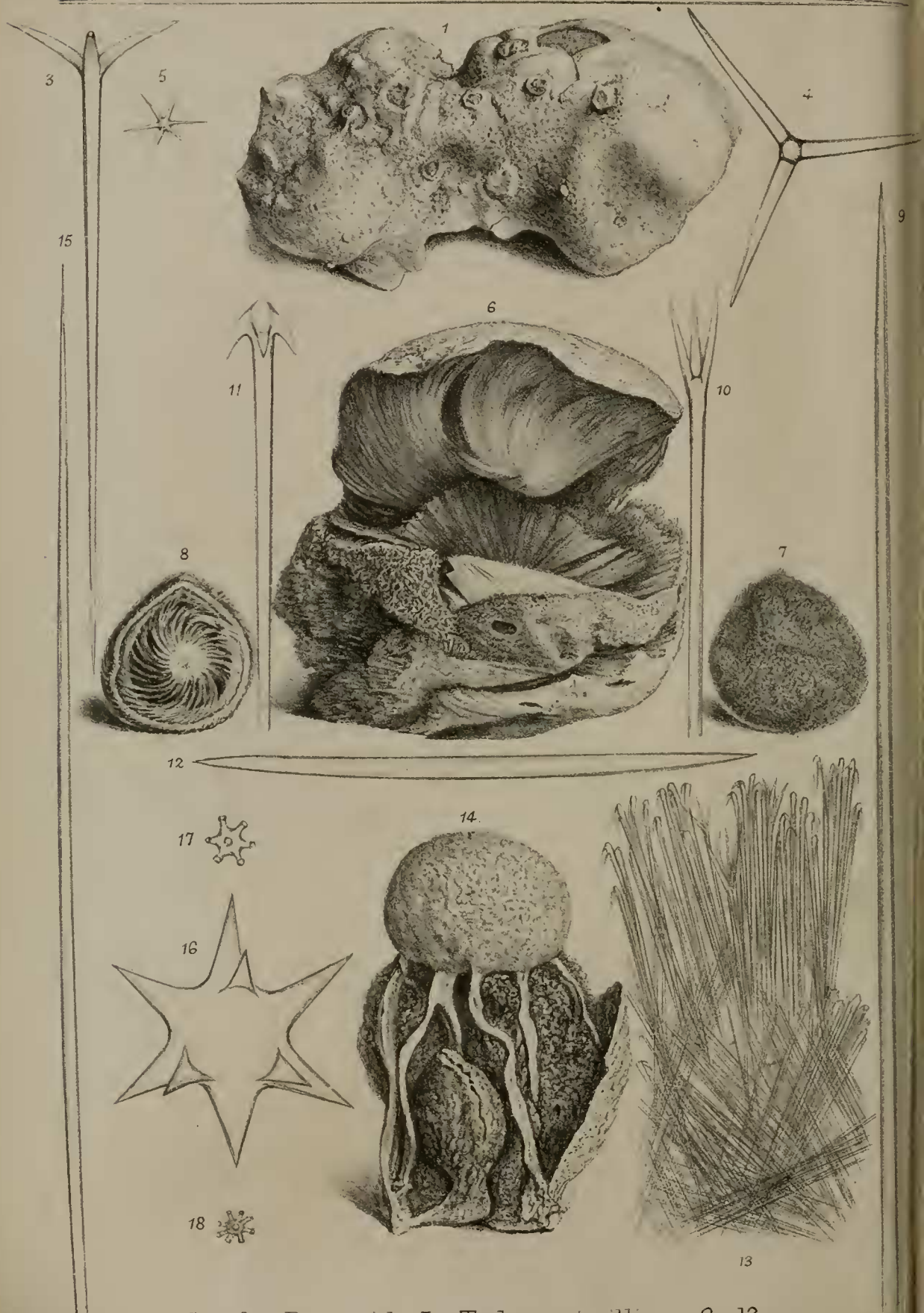
W. West & Co. imp.



Geodia perarmatus 1–11. Tethea robusta 12–17. Geodia inequalis 18–23. G. media 24–29.

W. Lens Aldous del et lith

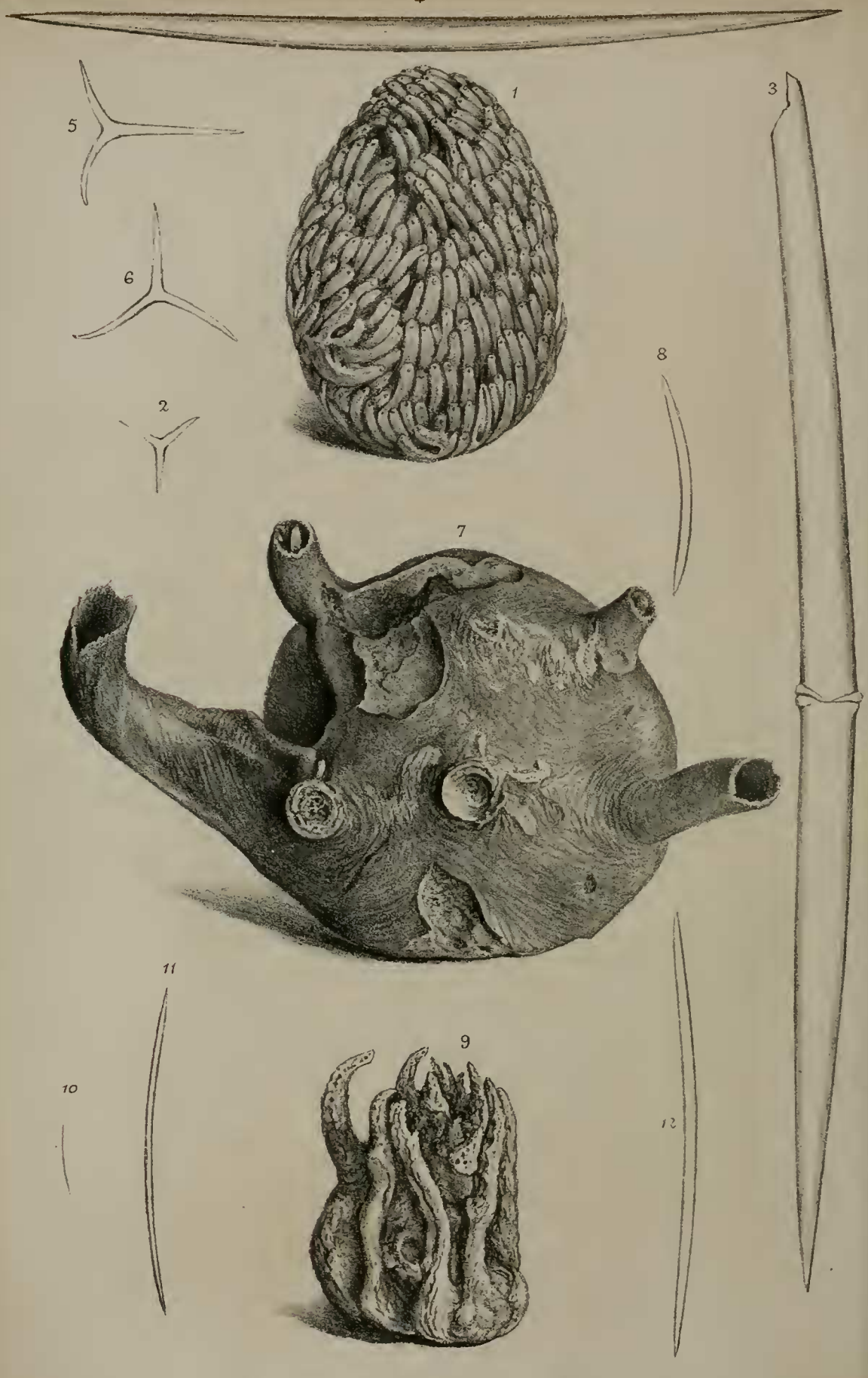
W. West & Co imp



Geodia Dysoni 1–5. Tethea simillima 6–13.
Tethea Cliftoni 14–18.

W. Lens Aldous del et lith

W West & C° imp.



Leuconia glomerosa 1–6. Desmacidon fistulosa 7–8.
Ciocalypta Tyleri 9–12.

W. Lens Aldous del. et lith
W. West & Co. imp.

much like a Cormorant. None of the figures hitherto published of the various species seem to me to give its proper attitude. The best, perhaps, are those of Audubon.

6. A Black-necked Stilt (*Himantopus nigricollis*, Vieill.), likewise received from Maranham, and also new to the Society's collection.

Mr. Sclater exhibited some skins of birds made up from a small collection in spirits, which had been sent to him by Dr. George Bennett of Sydney. Dr. Bennett stated that the specimens had been collected by Capt. Fergusson, of the steamer 'Captain Cook,' during a trading voyage to New Britain, New Ireland, and the neighbouring islands.

Mr. Sclater referred the specimens to the following species:—

1. *Sauloprocta melanoleuca* (Q. et G.). From New Britain. See P. Z. S. 1869, p. 119.
2. *Graucalus melanolorus* (G. R. Gray): Hartl. Journ. f. Orn. 1864, p. 443 *. From New Zealand.
3. *Merops ornatus*, Latham. From New Britain.
4. *Halcyon albicilla* (Dumont). From New Ireland.
5. *Halcyon chloris* (Bodd.). From New Ireland.
6. *Halcyon sanctus* (Vig. & Horsf.). From New Ireland.
7. *Loriuscardinalis*(Jacq. et Puch.). From Duke of York's Island†.

The following papers were read:—

1. Contributions to a General History of the *Spongiadæ*. By J. S. Bowerbank, LL.D., F.R.S., &c.—Part IV.

[Received November 1, 1872.]

(Plates I.–IV.)

Geodia Flemingii, Bowerbank. (Plate I.)

Sponge massive, sessile. Surface even, more or less hispid. Dermal membrane unknown. Connecting spicula attenuato-expando-ternate, simple or bifurcated, shaft occasionally cylindrical; also recurvo-ternate spicula, shafts slender and very long. Oscula congregated in dispersed, irregular groups, small and numerous. Pores inconspicuous. Interstitial membranes—retentive spicula of two sorts; large ones, cylindro-sphero-stellate with numerous short radii,

* Dr. Hartlaub, who has examined this specimen, tells me that it differs from examples of the species in the Bremen Museum from Batchian, Mysol, and Halmaheira, in "the under surface of the body being yellowish white, and the fore neck, breast, and epigastrium only of a somewhat darker, greyish shade." In the specimens from the above-named localities the grey colour of the under parts is "much more conspicuous and more extended." But without seeing further examples, Dr. Hartlaub would not like to separate it.—P. L. S.

† Dr. Bennett points out to me that this Lory differs from the specimen from the Solomon Islands, described and figured by Dr. Finsch (P. Z. S. 1869, p. 126, pl. xi.), in having the naked skin at the base of the lower mandible yellow. But it agrees otherwise so closely with Dr. Finsch's description and figure that I do not doubt its belonging to the same species. Duke of York's Island is between New Britain and New Ireland.—P. L. S.

and simple cylindro-stellate with comparatively long radii; small ones cylindro-stellate with very short radii. Skeleton-spicula fusiformi-cylindrical. Ovaria oval, variable in form.

Colour light cream-yellow.
Hab. Port Elliot, Australia (*Mr. Ray*).
Examined in the dried state.

I received this sponge with a considerable number of others of various genera from the Murray River, Australia, where they were collected by Mr. Ray. The specimen is an irregularly oval mass $1\frac{3}{4}$ inch long, $1\frac{3}{8}$ inch greatest breadth, and $1\frac{1}{2}$ inch high. On cutting off a portion of the sponge to examine its structure, I found the interior to be one large cavity, the parietes of the sponge not exceeding four lines at the thickest part, and near the basal portion about one line in thickness only, the excurrent canals running in a tortuous direction through the sponge to the oscula. The inner surface presented an irregular matting of spicula on membranous tissue, differing in no respect from other portions of the interior membranous structures.

The occurrence of this large cavity is interesting, as a similarly cavernous condition prevails in the type specimen of the genus, *Geodia gibberosa*, in the Paris Museum. I do not consider this hollow condition of such specimens the normal state of the sponge, and I should not expect to find it of common occurrence in this or any other species of the genus; it is probable that it is only in young and incompletely developed specimens, or by the accidental action of drying, that it would be found to occur.

The surface-characters of the sponge are unfortunately nearly obliterated, apparently by maceration and attrition. No portion of the dermal membrane is preserved. Sections at right angles to the surface exhibit the remains of a few large spicula that have passed through the dermal crust and have been projected about one-third of their length beyond the surface, which in its natural condition was therefore more or less hispid. The connecting spicula are few in number and very irregularly disposed, and the terminal radii are more frequently simple than they are dichotomous. The spicula of the skeleton vary considerably in their proportions; and the greater part of the ovaries have the apices of the radial spicula of which they are composed more or less acute. From the whole of these circumstances combined, it may naturally be inferred that the specimen is not in a fully matured condition.

The connecting spicula are exceedingly various in form. In their early state they are simple expando-ternate ones; as they advance in size one or more of the rays exhibit symptoms of bifurcating; and you may thus trace their progressive development until they attain the size and proportions of the fully developed spiculum represented by fig. 3, Plate I. In the completely developed condition they are not very numerous; nor, indeed, are they abundant in any state.

The recurvo-ternate spicula are very slender in their proportions, and their shafts are usually exceedingly long.

The largest description of stellate retentive spicula vary greatly in their size and degree of development, and also in the number of their radii. In some there are little or no indications of a spherical central mass, and the number of radii does not exceed six or eight, while others have well-developed central spheres and very numerous radii.

The small stellate retentive spicula are very much more numerous than the larger ones, and they all appear to have well-developed spherical centres. The extreme diameter of an average-sized one measured $\frac{1}{3500}$ inch; and a smaller one did not exceed $\frac{1}{4000}$ inch. The average greatest diameter of the larger description of stellate retentive spicula was $\frac{1}{1000}$ inch.

The ovaria do not exhibit any important specific characters.

I have dedicated this species in memory of the veteran naturalist the late Dr. Fleming, who has worked so much and so ably to extend our knowledge of British natural history, and to whom we are indebted for the first detailed description of a British *Geodia*, under the title of *Cydonium Müllerí*, in his 'History of British Animals,' p. 515.

Geodia depressa, Bowerbank. (Plate I.)

Sponge massive, sessile; surface minutely hispid, even. Oscula congregated in depressed areas, numerous, small. Pores inconspicuous, congregated? Skeleton-fasciculi large; spicula fusiformi-acerate, large and long. Connecting spicula attenuato-patento-ternate, large and long, and recurvo-ternate, radii stout, shafts long and slender. Interstitial membranes abundantly spiculous; retentive spicula attenuato-stellate, large and very numerous, and cylindro-sphero-stellate, small and very numerous. Ovaria spherical, slightly depressed.

Colour in the dried state cream-white.

Hab. Dardanelles (*J. T. Streatfield, Esq.*), Museum of Royal College of Surgeons, B. 181.

Examined in the dried state.

This sponge is in size and form very like an irregularly compressed Normandy pippin, its largest diameter being two and three quarters, and its greatest height an inch and three quarters. Its original attachment is at the thinnest part of its circumference, where there is a small univalve shell about a quarter of an inch in length imbedded, with a portion of a bivalve, apparently a *Mytilus*, attached to it; but other than these substances there are no appearances of attachment, and it had probably been freely floating about in the sea for a considerable period before it was taken. On that which is apparently its upperside, closely adjoining the shells above named, there is an irregularly oval depression an inch and half in length and about a quarter of an inch deep, in which the numerous small oscula are congregated, and surrounding which there is a thick crop of large and long fusiformi-acerate external defensive spicula; and the remains of similar spicula may be detected on other parts of its surface. Beside these large spicula, there is a secondary set of external defensive ones, which are very long and slender, projecting through the dermal surface for about one-third or one-fourth of their length, and

protecting the dermal membrane from its minute enemies. These spicula are in strong contrast with the primary series of external defensive ones, which equal those of the skeleton in length and diameter. They are frequently $\frac{1}{8}$ of an inch in length, with a diameter of $\frac{1}{545}$ inch, while those of the long and slender secondary series are from $\frac{1}{12}$ to $\frac{1}{14}$ inch in length, and do not exceed $\frac{1}{6000}$ inch in diameter.

The sponge has evidently suffered from partial decomposition, and I could not find any portion of the dermal membrane remaining in a condition for satisfactory examination; but if we may judge by the profusion of the spicula in the other membranes of the sponge, it will probably prove to be abundantly spiculous.

The skeleton-fasciculi are large and strong, and especially so near the dermal surface, where strong shafts of the patento-ternate connecting spicula are incorporated with them. The latter form are very numerous and much larger and stouter than those in many other species of the genus. Their length frequently exceeds $\frac{1}{6}$ inch, their greatest diameter is $\frac{1}{461}$ inch, and the expansion of their ternate radii varies from $\frac{1}{50}$ to $\frac{1}{170}$ inch. The average dimensions of the skeleton-spicula is, length $\frac{1}{8}$ inch, and greatest diameter $\frac{1}{545}$ inch.

The recurvo-ternate spicula are also more than usually large and numerous; their slender shafts are frequently $\frac{1}{4}$ inch in length, while their greatest diameter does not exceed $\frac{1}{2000}$ inch.

The interstitial membranes are in a fine state of preservation, and are coated abundantly with sarcode; and in many parts they are literally crowded with the two forms of stellate retentive spicula, each form being about equally abundant; on some parts of the membranes they are so numerous as to render it impossible to discriminate their forms.

There is another, a larger specimen of *G. depressa* in the Museum of the Royal College of Surgeons. In its general anatomical details it is in perfect accordance with the one described. In the larger specimen, on what was probably the upperside of the sponge, rather on one side near the thickest portion, there is an elliptical orifice five eighths of an inch long by a quarter of an inch wide, leading into an expanded cavity one and a half inch deep, in which most probably the oscula are congregated, as we find them to be in many other species of the genus. On the distal end of the sponge thelittle depressions on its surface indicating the intermarginal cavities beneath are in a good state of preservation; and it is probable, from their forms and modes of disposition, that the pores in this species are congregated.

GEODIA GIBBEROSA, Lamarck. (Plate I.)

Sponge massive, sessile; surface more or less tuberculated. Dermal membrane thin, pellucid? Connecting spicula attenuato-patenti-ternate, slender. Oscula small, congregated in depressed areas in mature specimens; loosely congregated or dispersed in young specimens. Pores inconspicuous. Skeleton-spicula fusiformi-acerate, slender, and, rarely, acuate slender. Interstitial

membranes—tension-spicula fusiformi-acerate, small and few in number; retentive spicula attenuato-stellate, radii long and slender; and cylindro-stellate, radii short and stout, minute. Ovaria globose, slightly depressed.

Colour cream-yellow in the dried state.

Hab. Martinique and Porto Rico, Antilles (*Lamarck*); Island of Dominica, West Indies (*Dr. Fleming*).

Examined in the dried state.

The type specimen of the genus is preserved in the Museum of the Jardin des Plantes at Paris. It is subglobose in form, with numerous slight and irregularly shaped elevations dispersed over its surface; and it is from $4\frac{1}{2}$ to 5 inches in diameter.

There is one large oscular area about an inch in diameter, somewhat sunk beneath the general surface, and contained within a well-defined marginal ring, the greatest diameter of which is about two inches. Nearly the whole of the radial fasciculi of the skeleton have apparently been scooped out, to facilitate the drying of the specimen, through a large hole in the sponge about $1\frac{1}{2}$ inch in diameter; and so effectually has this operation been performed that the sides of the sponge do not appear to exceed about half an inch in thickness in its dried condition.

There is a second specimen of apparently the same species of *Geodia* in the French Museum, somewhat larger than the type one, varying from $5\frac{1}{2}$ to 6 inches in diameter. The form is nearly the same as the first, but the surface more prominently tuberculated, and more conical in form; but these slight variations are of no importance as specific characters. This specimen, like the type one, has a single nearly circular oscular area, with a well-defined marginal ring, the diameter of which is about $1\frac{1}{2}$ inch; it has also a large hole about $1\frac{1}{2}$ inch in diameter; and the interior substance of the sponge has evidently been removed to facilitate the drying of the specimen. These specimens were hitherto considered to be the only two known. Through the kind assistance of Professors Milne-Edwards and Valenciennes, I had an opportunity of thoroughly examining their organization; and from them, and from a third one in the possession of Dr. Andrew Fleming, son of the late veteran naturalist, Professor Fleming of Edinburgh, I have constructed the above specific characters.

The oscula in Dr. Fleming's specimen are so small as to be scarcely discernible without the aid of a lens. On one side of the sponge they are dispersed; but on other parts they are congregated in small groups, but not especially so in the depressions of the surface. They are each furnished with a contractile membrane; some of them were completely closed, while others were more or less in an open condition. The difference in the disposition of the oscula in Dr. Fleming's specimen and those in the French Museum, may probably be accounted for by the younger and less-developed state of the smaller specimen.

Unfortunately all the three specimens have much deteriorated, apparently by maceration in water, or by repeated washing; so that

there remains scarcely a trace of the dermal membrane or of the sarcodous stratum immediately beneath it, and the greater portion of the sarcode of the interior is also destroyed. A few minute external defensive spicula were seen projecting from one portion when sectioned for examination, and a few small fusiformi-acerate ones lying parallel to the surface, apparently belonging to the membranous tissue, being all that I could detect. In some of the depressions of the surface of Dr. Fleming's specimen there are the remains of a very thin parasitic sponge with spinulate spicula, which might readily be mistaken for a portion of the absent dermal membrane, while in truth they have no organic connexion with the *Geodia*.

The skeleton-spicula of this species, although similar in form to those of *G. zetlandica*, differ exceedingly in size, the latter having the average length of one eighth of an inch, while those of the former rarely exceed one eighteenth of an inch in length. They are slender in proportion, and intermingled with the fusiformi-acerate spicula; there are a very considerable proportion of purely acerate ones exhibiting no tendency to the fusiform shape. The two forms of stellate spicula of the sarcode are indiscriminately mixed and dispersed in that substance; and the cylindro-stellate ones are very much the smaller of the two, requiring a linear power of at least 600 to render their forms visible; their extreme diameter does not exceed $\frac{1}{4666}$ inch, while the attenuato-stellate ones vary from $\frac{1}{1400}$ inch to $\frac{1}{933}$ inch in diameter.

The spicula of the membranes are few in number, small, and in many cases scarcely, if at all, fusiform.

I did not observe any prolific or immature ovaria in the external crust of the sponge; but in the internal membranes they were in every stage of development. The immature ones always appeared to be completely surrounded by a thick coat of sarcode; but this sarcodous coat was not apparent in the fully developed ones.

The spicula figured are from Dr. Fleming's specimen, from the Island of Dominica. They are identical in all their structural characters with those from the specimens in the French Museum in my possession.

GEODIA PERARMATUS, Bowerbank. (Plate II.)

Sponge massive, sessile. Surface even. Oscula congregated in depressed areas. Pores inconspicuous, dispersed. Dermal membrane pellucid, spiculous; tension-spicula fusiformi-acerate, minute, short, rather few in number; retentive spicula subsphero-stellate, radii attenuating, rather obtusely terminated, very few in number, and simple attenuato- or cylindro-stellate, very minute, abundant. Skeleton-fasciculi compact; spicula fusiformi-acerate, large and stout. Connecting spicula attenuato-patenti-ternate with bifurcating radii, very large and stout; and recurvo-ternate, small and slender, shafts long and attenuated; also porrecto-ternate, minute and slender. Interstitial membranes—spicula the same as those of the dermal membrane. Ovaria spheroidal, slightly depressed.

Colour in the dried state cream-yellow.

Hab. Unknown (*Mr. Thos. Ingall*).
Examined in the dried state.

I received this sponge from my late friend Mr. Thomas Ingall in 1861. He purchased it with other specimens, the localities of which were unknown. The specimen is evidently in a young and somewhat immature state, and it is very probable that its form would undergo considerable modification in a more fully developed condition; but even in its present state it is a very remarkable species. The surface is even but very rough to the touch, in consequence of the projection of the radii of many of the large bifurcating patento-ternate connecting spicula. Although so young, there are already two well-developed oscular areas upon its surface—one in a rather deep depression, and the other nearly level with the external surface. Very little remains of the dermal membrane; but what there is of it is crowded with the minute attenuato-stellate retentive spicula, among which there are a very few of the larger subsphero-stellate ones. The acerate tension-spicula are scattered on the surface of the membrane and are rather few in number. The same spicula that occur in the dermal membrane are found dispersed over the surface of the interstitial ones, but they are much fewer in number than on the dermal membranes.

It is a remarkable circumstance in this specimen that many of the connecting patenti-ternate spicula, the triradiate heads of which in other species of *Geodia* are attached to the inner surface of the dermal crust of the sponge, in this one are projected forward to such an extent through the stratum of siliceous ovaria that their radii are seen emerging immediately at the dermal surface, while others are seen at and near the inner surface of the dermal crust. This difference in the disposition of these spicula from those in other species of the same genus may probably be accounted for by the fact that the specimen under consideration is most likely in an early stage of its growth and development, and that in future examinations of larger and more completely developed individuals the connecting spicula will be found occupying their usual positions immediately beneath the dermal crust.

The recurvo-ternate spicula occupy their usual position beneath the dermal crust; their long slender shafts are incorporated with the skeleton-fasciculi, their heads appearing in the intermarginal cavities.

The progressive development of the bifurcating patento-ternate connecting spicula is exceedingly well illustrated in this sponge. They are first observed to be small and slender with simple patento-ternate radii acutely terminated; and in this form they remain, gradually increasing in length and stoutness until they attain the size represented by fig. 5, Plate II. As they approach their complete state of development the bifurcations of the radii become more or less produced, but frequently in a very unequal manner, as in fig. 6, the furcations being developed on one or two of the primitive rays, while the third remains simple; but when their

development has been fully accomplished, they exhibit the forms represented by figs. 3 and 4. The adult form only is available as a specific character.

The small porrecto-ternate spicula must not be confounded with the young state of the large bifurcating expando-ternate ones. They are always much more delicate in their structure; their ternate radii are projected at a very different angle from those of the former description; and their shafts are not rapidly attenuated and comparatively short, but in their perfect state are very long and slender.

The skeleton-spicula vary to some extent in size, many of them exceeding in length and stoutness the one figured.

The large subsphero-stellate retentive spicula are exceedingly few in number; and all that I have seen have a well-defined spheroidal centre, the like of which I have never observed in the numerous minute ones.

TETHEA ROBUSTA, Bowerbank. (Plate II.)

Sponge subspherical, sessile; surface even, strongly tuberculated; tubercles depressed, large, and numerous. Oscula and pores inconspicuous. Dermis coriaceous, very thick, crowded with very large sphero-stellate spicula with short acutely conical radii; dermal membrane obsolete. Skeleton-fasciculi multispiculous, large, closely compacted, expanding at their distal apices to form the corymbose fasciculi of the tubercles of the dermal surface; spicula inequifusiformi-cylindrical, large and long. Interstitial membranes abundantly spiculous; retentive spicula of three sorts:—first, of very large sphero-stellate, the same as those of the dermal rind, comparatively few in number, dispersed; second, small cylindro-stellate, radii rarely attenuated, very numerous; third, minute cylindro-stellate, radii short, distal terminations clavate, very numerous.

Colour in the dried state light grey.
Hab. Australia (*Mr. Stutchbury*).
Examined in the dried state.

I examined this sponge at the British Museum many years since, very shortly after its purchase, with other sponges from Australia, from the late Mr. Stutchbury; and I figured one of the large sphero-stellate spicula in my paper "On the Anatomy and Physiology of the Spongiadæ," published in the 'Philosophical Transactions' for 1858, plate xxv. fig. 15, and also in vol. i. plate vi. fig. 165, of my 'Monograph of the British Spongiadæ.' On applying to Dr. Gray for the use of the sponge at the British Museum that it might be figured, I was informed on January 11, 1872, by his late brother Mr. G. R. Gray, that the specimen could not be found; I have therefore figured a thin slice of it which was taken from it for microscopical examinations. This affords an excellent sectional view of the most important structural characters of the sponge. I can therefore only describe its general external characters from recollection. It was not, I think, quite perfect, and did not much

exceed an inch in diameter. Originally it had been nearly spherical in form; it was in the dried state when I examined it. When alive it would probably have been about two inches in diameter; and, judging its surface characters by those of the well-known British species *T. lyncurium*, which in many points it closely resembles in its anatomical characters, it would in the living state have presented a smooth surface, and in the dried state, as shown by the section figured and the microscopical sections in Canada balsam in my possession, it would have been abundantly furnished with large depressed tubercles.

The oscula and pores are not distinguishable; nor could I detect the slightest indication of a dermal membrane. The dermal rind is more than usually thick in this species of the genus. The closely packed mass of the thick stratum of large sphero-stellate spicula, and their enveloping membranes, of which it is composed, would naturally prove a serious impediment to the inhalant operations of the sponge. To remedy this obstruction, the inhalation is effected through numerous very deep cylindrical depressions, which are found between the corymbose distal terminations of the skeleton-fasciculi; these depressions form cylindrical sacs the depth of which is three or four times their own diameter, and extending nearly or quite to the inner surface of the dermal rind. Similar but more highly developed organs exist in several species of *Geodia*, as in *G. Barretti* and *M'Andrewi*, through which aërating and nutrient streams have access to the interior of the sponge.

The skeleton-fasciculi radiate from a central mass composed of numerous loosely compacted bundles of spicula of the same form as those of the skeleton, but very much smaller; these fasciculi do not appear to have any definite arrangement, but cross each other in every direction. The skeleton-fasciculi proceeding from the central mass are large and closely compacted, and in this state they enter the inner surface of the dermal rind, and commence separating and radiating to form the corymbose terminations at the distal surface of the dermal rind of the sponge; and they expand to such a degree that the large dermal tubercles thus formed are in very close conjunction on the surface.

The stellate spicula of this species are very remarkable. The extreme diameter of a fully developed one of the largest description is $\frac{1}{468}$ inch, and the radii are, comparatively, exceedingly large and stout. The number of these organs is very great; and in the dermal rind they are so closely packed that the rays of each pass between those of the adjoining ones, and the whole become, as it were, cemented into a solid mass.

The two smaller ones are also exceedingly abundant on the interstitial membranes. They occur in about equal quantities, thickly dispersed over the membranes. The largest of the two, the cylindro-stellate ones, have an average extreme diameter of $\frac{1}{2148}$ inch; while the smaller cylindro-stellate ones do not exceed $\frac{1}{3520}$ inch in diameter, being less than one-third of the greatest diameter of a skeleton-spiculum, which measured $\frac{1}{1052}$ inch.

GEODIA INÆQUALIS, Bowerbank. (Plate II.)

Sponge irregularly massive, sessile; surface minutely pitted. Oscula congregated in irregular groups. Pores congregated in minute pits. Dermal membrane obsolete. Skeleton-fasciculi loosely constructed; spicula rather few in number, inequicylindrical, variable in size. Connecting spicula expando-ternate; radii short; shafts long, slender, and attenuating. Interstitial membranes spiculous; tension-spicula inequicylindrical, long and very slender, few in number; retentive spicula attenuato-stellate, very variable in size, number, and degree of attenuation of their radii, comparatively few in number; also cylindro-stellate, very minute, radii numerous and short, very abundant. Ovaria spherical or somewhat oval, slightly depressed.

Colour in the dried state cream-white.

Hab. Unknown.

Examined in the dried state.

I received this sponge with other specimens from my late friend Mr. Thomas Ingall in 1861, without any account of its locality. The specimen has every appearance of having been freely floating about in the sea for some time, as no traces of a basal attachment can be detected on any part of it, and at the part indicated in fig. 18, *aa*, there is a group of sand-worms which have built their cases upon its surface. I could not detect any portion of a dermal membrane; but, from the excellent state of preservation of the interstitial structures of the sponge, there is no doubt of its being alive when taken from the sea. Several groups of oscula dispersed over the surface represented in the figure, and especially on the part immediately above the open mouths of the sand-worm-cases at *a*; but on the reverse of the figure there are no oscular groups. The oscula are rather small; and, in consequence of the absence of the dermal membrane, the depressed areas of the distal ends of the intermarginal cavities are almost as large as the oscula; but a careful observation soon enables us to discriminate the one from the other.

The skeleton-spicula are very loosely combined in the skeleton-fasciculi, and they are rather few in number; their inequicylindrical form affords an excellent specific character. It is the only *Geodia* in which I have yet seen that form of skeleton-spiculum; they vary to some extent in size, but the form is constant.

The stellate retentive spicula of the largest description vary to a considerable extent; their extremes are well represented by figures 21 and 22, Plate II. In the form represented by fig. 21 the radii are very numerous and acutely conical, while in that of fig. 22 they have very much more slender radii and comparatively few of them; but intermediate forms in every degree may be readily found among them. Their average diameter is $\frac{1}{837}$ inch. The smaller description, the minute cylindro-stellate ones, are very numerous and much more constant in their forms than the larger ones; their average diameter is $\frac{1}{3750}$ inch. The interstitial membranes are rather thickly coated with dark amber-coloured sarcode, and in many parts they are quite crowded with the two descriptions of stellate spicula.

The remarkable forms of these spicula, combined with the inequicylindrical skeleton ones, render the discrimination of this species comparatively easy.

The ovaria in the dermal crust are all fully developed; but on the interstitial membranes they may be seen in all stages of development, from a size not exceeding that of one of the largest of the stellate spicula to that of the fully developed ovarium.

GEODIA MEDIA, Bowerbank. (Plate II.)

Sponge massive, sessile; surface smooth. Oscula congregated in slightly depressed areas. Pores inconspicuous, congregated. Dermal membrane obsolete. Sheleton-fasciculi large, multispiculous, rather closely compacted; spicula fusiformi-acerate, short and stout. Connecting spicula attenuato-patenti-ternate, rather short, strongly developed. Interstitial membranes—tension-spicula acerate, small and few; retentive spicula attenuato-stellate, radii acutely conical, very variable in number, and cylindro-stellate very minute. Ovaries slightly oval, depressed.

Colour in the dried state pale buff-yellow.
Hab. Mexico (*Mr. Thomas Ingall*).
Examined in the dried state.

I received this sponge from my late friend Mr. Thomas Ingall, labelled Mexico. The reverse side to that figured is smooth and regularly curved, with faint parallel striæ at right angles to the curve, as if it had been based on a shell with raised lines upon it or on the stem of a coral. The mass of the sponge is not perfect, portions having been broken away from both ends of it; but the specimen has evidently never been much larger than it is at present. The oscula occupy two well-defined areas, which are very slightly depressed. The porous areas are visible by the aid of a lens of two inches focus; they are not so numerous as in many other species of this genus. I could not find any remains of the dermal membrane. The skeleton is rather strongly constructed; the skeleton-fasciculi are both large and numerous. The connecting spicula are also strong and numerous; and their shafts, incorporated with the distal ends of the skeleton-fasciculi, contribute greatly to the strength and firmness of the skeleton-structures immediately beneath the dermal crust. In their adult state the connecting spicula are large and strong, and their radii patenti-ternate; but in the young and immature condition they are more or less expando-ternate, and they are found in every stage of development. There were very slight indications of the presence of recurvo-spicula. I observed among the spicula separated by nitric acid the remains of one very small specimen, and a fragment of another in one of the sections mounted in Canada balsam.

The tension-spicula of the interstitial membranes are very small and few in number.

The largest description of attenuato-stellate retentive spicula vary to some extent in the number of their radii; some have but three or four, while others have as many as twelve or fourteen. In the

largest and best-developed ones the radii occasionally appear very delicately incipiently spinous. These spicula are rather numerously distributed on the membranes. The smaller sphero-stellate ones are not so numerous; but they are more regular in their forms than the larger ones.

The general characters of this species render it not very difficult of discrimination.

A few doliolate spicula were found among those separated by the aid of nitric acid; they vary in their forms to some extent: the one figured is the largest I observed.

Geodia Dysoni, Bowerbank. (Plate III.)

Sponge massive, sessile? Surface uneven but smooth. Oscula simple, small, numerous, dispersed rather regularly. Pores inconspicuous. Dermal membrane obsolete. Skeleton somewhat slender and delicate; fasciculi numerous; spicula fusiformi-acerate, rather small comparatively. Connecting spicula attenuato-patenti-ternate, rather slender; radii variable in size. Interstitial membranes—retentive spicula attenuato-stellate, small, and delicate. Ovaria spherical, slightly depressed.

Colour in the dried state cream-white.
Hab. Honduras (*Mr. Dyson*).
Examined in the dried state.

I received a single specimen of this sponge from Mr. Dyson, who found it at Honduras. It has probably been a beach specimen, as nearly the whole of the dermal membrane has been destroyed, and the specimen itself is apparently a portion only of a larger sponge, the under part being quite destitute of dermal crust.

The oscula are simple orifices of nearly equal size; they are found in about equal numbers on all parts of the dermal surface, and they are dispersed at very nearly regular distances from each other.

The dermal membrane is nearly all destroyed; but the membranes investing the ovaria in the dermal crust are in a good state of preservation, and so are the interstitial ones, though the sarcode is not very abundant upon them. These conditions of the specimen seem to indicate that the sponge has undergone decomposition to some extent. A few very small fragments of the dermal membrane were detected on the external surfaces of the slices mounted for examination; they were aspiculous and very translucent; but it is probable that when in a more natural condition it would be found to possess the same spicula as the interstitial membranes immediately beneath the dermal crust, and very likely in greater numbers than in those organs under their present circumstances. The attenuato-stellate retentive spicula are rather abundant on some parts of the interstitial membranes; and a few exceedingly minute radiate spicula were interspersed among them.

The skeleton-spicula, compared with many other species of *Geodia*, may be designated as rather small and slender, and the skeleton-fasciculi delicate in proportion. The connecting spicula are rather

numerous. They vary to a considerable extent in the degree of development of their triradiate heads, the rays in some being twice the length of those in others.

The ovaria are abundant in the dermal crust; and they are also numerous on the interstitial membranes, where they are found in every stage of progressive development, some of them having a diameter not more than one-tenth part that of the mature ovarium; in their fully developed state they are globular with a very slight amount of depression.

Tethea similima, Bowerbank. (Plate III.)

Sponge globular, sessile; surface even, strongly hispid. Dermal coat abundantly furnished with stout fusiformi-acerate spicula surrounding the defensive fasciculi. Dermal membrane thin, pellucid. Oscula and pores inconspicuous. Spicula of the skeleton fusiformi-acerate large, and long. Defensive spicula external, collected in fasciculi; fusiformi-acerate large and long, few in number; fusiformi-porrecto-ternate abundant, radii short and stout; and attenuato-recurvo-ternate very abundant, shaft slender, very much attenuated. Sarcode furnished sparingly with minute bihamate spicula. Gemmules lenticular, surface smooth, tough, and strong; furnished with fusiformi-acerate attenuated unihamate or occasionally bihamate, and with short slender porrecto-ternate spicula mixed in fasciculi radiating from the centre of the gemmule.

Colour, dried, light brown.
Hab. South Seas (*Sir Everard Home*).
Examined dried and in spirit.

The characters of this species are given from two specimens brought home from the South Seas by Sir Everard Home. The most perfect specimen is in the dried state, and measures eleven lines in diameter. The second one is about one third of a much larger specimen, not less than two inches in height, and is in spirit; both specimens are in the Museum of the Royal College of Surgeons.

This species is remarkable for the very close resemblance it has to *Tethea cranium* of our northern seas; and although I have designated it as a species, I have great doubt whether it should be thus distinguished. The same forms of spicula are found in both; but their comparative proportions and the degree of their prevalence in the respective parts of the sponge differ to a considerable extent. There is but a very little difference between the skeleton-spicula; those of *T. simillima* are slightly the longer and greater of the two: but in the defensive spicula there is a considerable amount of discrepancy. In the projection of the defensive fasciculi of *T. cranium* the appearance of recurvo-ternate spicula is very rare, while in *T. simillima* they are almost as abundant as the porrecto-ternate ones; and in the first-named species the radii of the porrecto-ternate spicula are very much longer and more attenuated than in the last species named. In the sarcode of the small specimen of *T. simillima* I could not detect the minute bihamate spicula; but I found a few in that of the

larger specimen; while in *T. cranium* they are extremely abundant, but much more minute than those of *T. simillima*. I found but one description of gemmule in *T. simillima*, which was very similar in form and structure to the larger form that exists in *T. cranium*; and in these organs we again find a considerable difference in the proportions of the spicula of the two species. In *T. cranium* the porrecto-ternate spiculum of the gemmule is more slender in its general proportions, and the radii are expanded at a greater angle and are much longer than those of *T. simillima*. The unihamate spicula also exhibit a characteristic variation in form. In *T. cranium* the hamate apex is more clavate but the hook less produced than in *T. simillima*; in the latter the hook is not only very strongly produced, but the spiculum often becomes bihamate; and a practised eye would readily distinguish the one species from the other by these characters alone. Thus, although very closely allied in their general structure, there appears to exist a sufficient permanent structural difference to warrant our considering them distinct species.

Tethea Cliftoni, Bowerbank. (Plate III.)

Sponge spherical, slightly depressed, sessile. Surface even, smooth, minutely pitted or areolated, areola very shallow. Oscula and pores inconspicuous. Dermal rind thick and very solid, exterior and interior surfaces furnished with a thick stratum of large closely packed sphero-stellate spicula; radii acutely conical; interspaces with comparatively few of the large sphero-stellate spicula, but abundantly supplied with minute subsphero-stellate spicula with clavate cylindrical radii, variable in form and size. Dermal membrane aspiculous. Skeleton—radial fasciculi polyspiculous; fasciculi compact, expanding slightly towards the dermal surface, through which their distal terminations pass, to a slight extent forming external defences; spicula fusiformi-acuate, rarely cylindrical, or fusiformi-acerate, large and long. Interstitial membranes—retentive spicula the same as those of the dermal rind, few in number. Sarcode dense.

Colour in the dried state light orange.
Hab. Fremantle, Australia (*Mr. G. Clifton*).
Examined in the dried state.

The form of this sponge is that of a slightly depressed sphere. Its greatest horizontal diameter is 13 lines, and its height 11 lines. Its location is especiallyremarkable. It is seated on the top of a mass of agglutinated sand and mussel-shells; and, apparently feeling the insecurity of its situation, it has given off from its base seven root-like basal processes, two of which divide shortly after leaving the sponge and proceed in different directions: the longest of these appendages is $1\frac{1}{2}$ inch, and its greatest diameter rather exceeding a line; it terminates in an irregularly formed adherent expansion about 3 lines in diameter. These root-like appendages form no part of the specific character of the sponge; they are projected, in accordance with the necessities of the individual, by almost every species of *Tethea* with which I am acquainted.

The pitting or areolation of the surface of the sponge is scarcely seen by the unassisted eye; with the aid of a two-inch lens it very closely resembles the pock-marks on the human face. The disposition of the large sphero-stellate spicula in the dermal rind is different from those in any other nearly allied species. Instead of being evenly distributed throughout its substance, they are collected into two dense strata at the outer and inner surfaces of that organ, while the intervening space has comparatively a few only distributed in its substance, and in these comparatively clear spaces the smaller description of subsphero-stellate retentive spicula are abundant. The large sphero-stellate spicula very closely resemble those of *Tethea robusta* and *T. Ingalli*; but they are less robust in form than those of the former, and more so than those of the latter species. The greatest diameter of one of the largest size was $\frac{1}{416}$ inch.

The minute subsphero-stellate retentive spicula with clavated cylindrical radii are exceedingly various in both size and form. In some the radii are slender with very slightly developed bulbous terminations, while others, with the radii quite as slender, have large well-developed distal terminations; and in some the radii are short and stout with a very slightly developed bulb. These minute organs are strikingly different in form from the corresponding ones in any of the nearly allied species, and are certainly the most distinctive of all the specific characters of the species. The average size of the greatest number is $\frac{1}{1500}$ inch extreme diameter; but there were a few that measured $\frac{1}{857}$ inch in diameter. They require a power of about 700 linear to distinctly demonstrate their forms; one of the smallest did not exceed $\frac{1}{3000}$ inch in extreme diameter.

The skeleton-spicula vary to a considerable extent in size and in the degree of their fusiformity, so as in some almost to simulate the acerate form. The really acerate and cylindrical ones are of very rare occurrence.

The sarcode in all parts of the sponge appears to be very dense.

It is most likely that succeeding specimens of this species may not exhibit any of the extraordinary basal appendages that render the specimen figured so singular in its appearance. Such organs appear to be only thrown out when a necessity for them arises from the peculiarities of the locality impeding the safe attachment of the young sponge. Similar appendages are projected from the bases of *Tethea norvagica*; and there is little doubt that such organs will be observed to be thrown out by other species of *Tethea* when a necessity for them arises.

LEUCONIA GLOMEROSA, Bowerbank. (Plate IV.)

Sponge sessile? composed of a closely compressed mass of repeatedly divaricating, slender, compressed, ascending branches. Surface smooth. Cloacæ continuous from base to apex of the branch through all its divarications; terminal orifice rarely ciliated; oscular surface coarsely reticulated; rete multispiculous. Oscula large and open. Pores inconspicuous. Dermis—dermal membrane thin, spiculous;

spicula equiangular, triradiate; radii short and stout; reposing on a closely packed stratum of very large and strong fusiformi-acerate dermal spicula disposed in lines in accordance with the long axis of the branch. Skeleton—interstitial structures sparingly spiculous; spicula inequitriradiate, variable in size and form.

Colour in the dried state cream-white.
Hab. Port Elizabeth (*Capt. Charles Tyler*).
Examined in the dried state.

The basal attachment of the sponge has been destroyed; but the whole mass of closely compressed branches appear to spring from one basal mass or sessile attachment, dividing and subdividing into a complex mass of ramuli, each terminated with a fæcal orifice; the cloacæ, of which these orifices are the terminations, are continuous from the extreme proximal end of each branch to the distal end of each of its ramuli. The terminal orifices are rarely ciliated; but when they are so furnished the ciliary fringe is composed of a prolongation of the layer of large acerate spicula. When a longitudinal section of one of the ramuli is made and mounted in Canada balsam, the interior of the sponge forms a very interesting object, the whole of the inner surface of the cloaca being occupied with beautiful oscular reticulation; the rete is formed of broad flat threads of closely felted triradiate spicula; and within each area there is a well-defined osculum. In other well-known species of *Leuconia* we find a series of defensive spicula projected from the oscular surface, the points of these organs being usually inclined towards the mouth of the cloaca; but in this species no such spicula could be detected.

The dermal membrane is exceedingly delicate; it is furnished with numerous equiangular triradiate spicula; and in the present state of the sponge it is closely adherent to the dense stratum of large fusiformi-acerate spicula beneath it. The disproportion of the comparatively enormous spicula of which it is composed is very remarkable; and in their closely packed state they form a most efficient protection to the delicate interstitial structures beneath them. One of these large spicula separated with others from the sponge and mounted in Canada balsam presented a striking instance of the vitality of these organs. It had evidently been fractured near its middle while in its natural position during the life of the animal; the broken surfaces have been cemented together and a strong angular ridge thrown out to strengthen the reunited parts. This spiculum is represented in Plate IV. fig. 3. The reuniting of the soft parts of sponges is of exceedingly common occurrence; but this is the only instance among sponges analogous to the uniting of fractured bones among the higher classes of animals that I have hitherto observed. The interstitial structures between the dermal surfaces and the parietes of the cloaca are but sparingly spiculous; the spicula are inequitriradiate, having two short and one long ray. The two short ones are applied to the surface of either the cloaca or the inside of the dermal stratum; and their apices are slightly curved backwards, so as to bring them into about the same plane; while the

long ray is projected among the interstitial membranes at about right angles to either the dermal or the cloacal surface. The space between the cloacal and the dermal strata seldom exceeds the length of two long radii as projected from the opposite surfaces, their apices meeting and being cemented together by keratode. There are no interlacing spicula connecting these slender compound columns, the dense case of strong acerate dermal spicula affording sufficient protection and support to the delicately constructed interstitial tissues.

Desmacidon fistulosa, Bowerbank. (Plate IV.)

Sponge massive, sessile (?), furnished with long, slender, external, fistulous cloacæ. Surface smooth and even. Oscula and pores inconspicuous. Dermal membrane coriaceous, abundantly spiculous; spicula thickly but equably dispersed, same size and form as those of the skeleton. Skeleton—fibrous rete stout, elongately diffuse, most abundant near the external surface; interstitial rete regular, unispiculous, areas rarely exceeding the length of one spiculum in width; skeleton-spicula of both parts acerate, rather short and stout.

Colour in the dried state fawn-yellow.
Hab. Fremantle, Australia (*George Clifton, Esq.*).
Examined in the dried state.

I received two specimens of this remarkable species from my friend Mr. George Clifton. The one figured is rather the smallest of the two; but the form of the bulbous mass of the sponge is as nearly as possible the same in both. In the figured specimen there are four large cloacæ remaining; and two others have formerly existed, but have been rubbed off close to the dermal surface and their orifice healed over. On the second specimen nine fistulous cloacæ are projected from the distal surface; they are less in diameter than those of the figured one, and none of them exceeds an inch in height. There is a remarkable coincidence in the condition of the basal portions of the two specimens: each of them has undergone abrasion to such an extent as to have totally destroyed the dermal membranes of those parts, as if they had been freely floating about on a coarse sandy surface. On neither of them is there any indication of their having had stout root-like appendages for attachments; and the abraded surfaces consist of interstitial reticulate structure without any admixture of the stout spiculo-fibrous skeleton. The dermal membrane in its present state has a very coriaceous appearance, and on some parts of the surface it is wrinkled by drying, much like very thin leather under similar circumstances. It is rather thick and is abundantly spiculous; the spicula are short and stout, of the same size and form as those of the skeleton. They are thickly and irregularly but equably dispersed.

The fibrous portion of the skeleton prevails more especially near the dermal surface; and the fistulous cloacæ are composed almost entirely of it—long lines of primary fibres parallel to each other, connected by secondary ones at nearly right angles to the primary

fibres, forming a rather regular elongate reticulation; and the same mode of fibrous arrangement prevails on the bulbous surface of the sponge, but not with quite so much regularity in its structure. Beneath the fibrous stratum at the dermal surface, the sponge is principally composed of a mass of interstitial reticulate skeleton-structure, with a few long threads of spiculo-fibrous tissue running amidst it. The reticulate interstitial skeleton-structure is uniform and regular in its construction, the rete being unispiculous, and the areas rarely exceeding the breadth of the length of one spiculum; the spicula are of the same size and form in all parts of the sponge.

There is a considerable amount of similarity in form and structure between this Australian species and our British one, *Desmacidon Jeffreysii*. Both are bulbous in form, and they are both furnished with long fistulous cloacæ; but those of *D. fistulosa* are very much more delicate in their structure than the similar organs in *D. Jeffreysii*; and in the latter species there are large root-like basal processes which serve to elevate the *sponge* above the mass to which it may have been attached; but no such organs appear to have existed in *D. fistulosa*. The spicula in both sponges are exactly alike in size and form, but they do not agree in their mode of arrangement. In the dermal membrane of *D. Jeffreysii* they appear always to assume more or less of a reticulate arrangement; but in the like organ of *D. fistulosa* they are irregularly dispersed. The interstitial halichondroid part of the skeleton in both species also differs. In *D. fistulosa* it is very delicate and the rete is unispiculous, while in *D. Jeffreysii* the rete is often constructed of two or three spicula, and the areas are much larger and more irregular in their construction. In these structural characters there are therefore good and sufficient specific differences to discriminate the species. It is an interesting fact, but by no means a singular case, that we should have a fossil sponge from the hard chalk of Flamborough closely resembling the recent specimen, *D. fistulosa*, from Australia. This fossil sponge is described by Mr. John Edward Lee in Charlesworth's 'Magazine of Natural History,' vol. iii. for 1839, p. 15, as *Spongia spinosa*, and is represented in page 16, figs. 11 and 12; and I have by me a specimen of the same species of fossil from the locality mentioned by Mr. Lee, which is much more like the recent *D. fistulosa* than the specimens described and figured by that author. Not only does the fossil resemble the recent sponge in its external characters, but there is little doubt that in its living state its internal structure was also similar. Mr. Lee, in page 16 of his paper, writes, "Being anxious to see more of the internal structure, I had the specimen cut through just below the plates figured in the last diagram: an irregular fibrous structure then became visible, similar to that shown in fig. 12." The artist, in the figure of the specimen thus treated (13), has faithfully represented the fibrous structure alluded to, on each side of the lower part of the figure; and the fibrous structure is so like that in the corresponding part of the recent *D. fistulosa*, that the drawing would equally well represent the arrangement of the fibrous skeleton-tissues of either species.

From this case, and from other similar experiences, it appears that, if we wish to find the living representatives of the beautiful series of the chalk sponges, we must search for them among the multitudinous singular forms of the recent animals that abound in Australian seas.

Ciocalypta Tyleri. (Plate IV.)

Sponge massive, sessile, composed of numerous, closely packed, attenuating, penicillate branches rising perpendicularly from a common base; branches gradually attenuating, apices rather acutely terminated, entirely closed, deeply furrowed or corrugated. Oscula simple, dispersed over all parts of the sponge. Pores inconspicuous, dispersed. Dermal membrane smooth, abundantly spiculous; spicula acerate, small and slender, dispersed, closely felted together over the whole surface of the membrane, with a few skeleton- or larger spicula intermixed. Skeleton-spicula acerate, rather variable in size.

Colour in the dried state cream-white.
Hab. Port Elizabeth (*Capt. Charles Tyler*).
Examined in the dried state.

I received two specimens of this interesting species from my friend Capt. Charles Tyler, who obtained them from Port Elizabeth. The one figured is the smallest of the two; but it is the most characteristic in its growth and general external appearance, which, in both specimens, so closely resemble those of the British species in its early stage of growth, that it would be impossible to separate the two species if it were not for the differences that exist in their organization. The structure of the skeleton of *C. Tyleri* is in principle exactly that of *C. penicillus*. There is the same central column in each of the penicillate organs, with numerous short pedicels of closely compacted spicula radiating from it at right angles to the axis, their distal ends diverging at various angles over the inner surface of the dermis; but their mode of disposition is not nearly so regularly elegant as in the British type species. Although so closely resembling each other in external form, there is no difficulty in discriminating the two species by their anatomical characters, the forms of their respective skeleton-spicula at once affording an unerring means of separation, those of *C. penicillus* being fusiformi-acuate, while those of *C. Tyleri* are acerate. The dermal membrane also of the former species has its spicula fasciculated in the form of a regular and beautiful reticulation, while the spicula in the latter species are irregularly dispersed and closely felted together on the surface of the membrane. The inhalant and exhalant systems are the same in each species.

This species is especially interesting, not only from the singularity and beauty of its anatomical structure, but from its exceedingly close resemblance to our British species, although so widely separated from it as regards locality. The British type specimen of the genus, as figured in vol. iii. pl. xiii. fig. 2, 'Monograph of British

Spongiadæ,' is very much more largely developed than the subject of our present description; but several small specimens of *C. penicillus* that I subsequently obtained are as nearly as possible of the same size and external appearance as those of *C. Tyleri*.

DESCRIPTION OF THE PLATES.

Plate I.

Geodia Flemingii, Bowerbank.

Fig. 1 represents the type specimen based on a mass of Nullipora and sand, natural size, exhibiting a portion of the irregular groups of oscula.
Fig. 2. A view of the reverse of fig. 1, exhibiting a section of the sponge and its hollow interior.
Fig. 3. A fully developed attenuato-expando-ternate bifurcated connecting spiculum, magnified 80 linear.
Fig. 4. One of the recurvo-ternate spicula, magnified 80 linear. The greater number of these spicula have their shafts very much longer than the one represented.
Fig. 5. A fusiformi-cylindrical skeleton-spiculum, magnified 80 linear.
Fig. 6. One of the large cylindro-stellate retentive spicula with numerous short radii, magnified 530 linear.
Fig. 7. A simple cylindro-stellate retentive spiculum, magnified 530 linear.
Fig. 8. One of the small cylindro-stellate retentive spicula, magnified 530 linear.

Geodia depressa, Bowerbank.

Fig. 9 represents the type specimen in the Museum of the Royal College of Surgeons, London: natural size.
Fig. 10. Half of one of the large fusiformi-acerate skeleton-spicula, magnified 80 linear.
Fig. 11. One of the large attenuato-patenti-ternate connecting spicula with large and long shafts, magnified 80 linear.
Fig. 12. A recurvo-ternate connecting spiculum with long and slender shafts, magnified 80 linear.
Fig. 13. An attenuato-stellate retentive spiculum from the interstitial membranes, magnified 530 linear.
Fig. 14. One of the small and very numerous cylindro-sphero-stellate retentive spicula from the interstitial membranes, magnified 530 linear.
Fig. 15. An adult ovarium, magnified 230 linear.

Geodia gibberosa, Bowerbank.

Fig. 16 represents the specimen in the possession of Dr. Andrew Fleming, son of the late eminent naturalist Professor Fleming of Edinburgh: natural size.
Fig. 17. One of the attenuato-patenti-ternate connecting spicula, magnified 80 linear.
Fig. 18. A fusiformi-acerate skeleton-spiculum, magnified 80 linear.
Fig. 19. One of the slender acuate skeleton-spicula, magnified 80 linear.
Fig. 20. A small fusiformi-acerate tension-spiculum from the interstitial membranes, magnified 80 linear.
Fig. 21. An attenuato-stellate retentive spiculum from the interstitial membranes, magnified 530 linear.
Fig. 22. One of the minute cylindro-stellate retentive spicula, magnified 530 linear.

Plate II.

Geodia perarmatus, Bowerbank.

Fig. 1 represents the type specimen, natural size.
Fig. 2. One of the large fusiformi-acerate skeleton-spicula, magnified 80 linear.

Fig. 3. A large bifurcated patenti-ternate connecting spiculum, magnified 80 linear.
Fig. 4. The apex of a large-sized bifurcated patenti-ternate connecting spiculum, magnified 80 linear.
Fig. 5. A small simple attenuated expando-ternate connecting spiculum, magnified 80 linear.
Fig. 6. A young expando-ternate bifurcating connecting spiculum, exhibiting the gradual development of the bifurcations of the ternate radii, magnified 10 linear.
Fig. 7. One of the recurvo-ternate spicula, magnified 80 linear.
Fig. 8. A porrecto-ternate spiculum, magnified 80 linear.
Fig. 9. A large attenuato-subsphero-stellate retentive spiculum, magnified 530 linear.
Fig. 10. One of the minute cylindro-stellate retentive spicula, magnified 530 linear.
Fig. 11. A minute slender acerate tension-spiculum from the dermal membrane, magnified 80 linear.

Tethea robusta, Bowerbank.

Fig. 12. A section at right angles to the surface of *T. robusta*, from the type specimen in the British Museum: natural size.
Fig. 13. One of the skeleton-spicula from the large fasciculi, magnified 80 linear.
Fig. 14. A smaller skeleton-spiculum from the central nucleus, magnified 80 linear.
Fig. 15. One of the very large sphero-stellate spicula of the dermal rind, magnified 530 linear.
Fig. 16. A small cylindro-sphero-stellate retentive spiculum from the interstitial membranes, magnified 530 linear.
Fig. 17. One of the minute clavated cylindro-stellate spicula from the interstitial membranes, magnified 530 linear.

Geodia inæqualis, Bowerbank.

Fig. 18. The type specimen, natural size.
Fig. 19. One of the inequicylindrical skeleton-spicula, magnified 80 linear.
Fig. 20. An expando-ternate connecting spiculum with the shaft slightly curved, magnified 80 linear.
Fig. 21. A large attenuato-multiradiate retentive spiculum from the interstitial membranes, magnified 530 linear.
Fig. 22. An attenuato-subsphero-stellate retentive spiculum from the interstitial membranes, magnified 530 linear.
Fig. 23. One of the minute cylindro-subsphero-stellate spicula from the interstitial membranes, magnified 530 linear.

Geodia media, Bowerbank.

Fig. 24. The type specimen, natural size.
Fig. 25. One of the short stout acerate skeleton-spicula, magnified 80 linear.
Fig. 26. An expando-ternate connecting spiculum, magnified 80 linear.
Fig. 27. A multiradiate attenuato-stellate retentive spiculum from the interstitial membranes, magnified 530 linear.
Fig. 28. A minute cylindro-stellate retentive spiculum from the interstitial membranes, magnified 530 linear.
Fig. 29. A doliolate spiculum from the interstitial membranes, magnified 150 linear. These spicula are very few in number, and vary to some extent in their shape and size.

Plate III.

Geodia Dysoni, Bowerbank.

Fig. 1 represents the type specimen, natural size.
Fig. 2. One of the fusiformi-acerate skeleton-spicula, magnified 80 linear.

Fig. 3. An attenuato-patenti-ternate connecting spiculum of about the average size, magnified 80 linear.
Fig. 4. The head of one of the largest and most fully developed connecting spicula, magnified 80 linear.
Fig. 5. One of the attenuato-stellate retentive spicula from the interstitial membranes, magnified 530 linear.

Tethea simillima, Bowerbank.

Fig. 6 represents the type specimen in spirit in the Museum of the Royal College of Surgeons, London: natural size.
Fig. 7. The small specimen in the dried state, exhibiting a view of the external surface, natural size.
Fig. 8. A sectional view of the same specimen that is represented by figure 7, showing the central nucleus and the mode of disposition of the skeleton-fasciculi: natural size.
Fig. 9. Two thirds of one of the large fusiformi-acerate skeleton-spicula, magnified 80 linear. This figure also represents the same form of spiculum as an external defensive one.
Fig. 10. One of the fusiformi-porrecto-ternate external defensive spicula, magnified 80 linear.
Fig. 11. An attenuato-recurvo-ternate defensive spiculum, with long and very slender shaft, magnified 80 linear.
Fig. 12. One of the stout fusiformi-acerate spicula that surround the defensive fasciculi of the external surface, magnified 80 linear.
Fig. 13. A small portion of the skeleton of one of the gemmules of the sponge, extending from its centre to its external surface, showing its unihamate and porrecto-ternate spicula *in situ*, from a specimen mounted in Canada balsam: magnified 80 linear.

Tethea Cliftoni, Bowerbank.

Fig. 14. The type specimen, showing the remarkable mode of its location under difficulties: natural size.
Fig. 15. One of the fusiformi-acuate skeleton-spicula, magnified 150 linear.
Fig. 16. One of the large sphero-stellate spicula of the dermal rind of the sponge, magnified 530 linear.
Fig. 17. A minute subsphero-stellate retentive spiculum with clavated cylindrical radii, magnified 530 linear.
Fig. 18. A smaller specimen of the same description as that represented by fig. 17, magnified 530 linear.

PLATE IV.

Leuconia glomerosa, Bowerbank.

Fig. 1. The type specimen, natural size.
Fig. 2. One of the equiangular triradiate spicula of the dermal membrane, magnified 80 linear.
Fig. 3. One of the largest-sized fusiformi-acerate dermal spicula, which has been fractured near its middle and cemented together again: magnified 80 linear.
Fig. 4. A small-sized fusiformi-acerate dermal spiculum, magnified 80 linear.
Figs. 5 & 6. Two of the triradiate spicula of the interstitial skeleton, magnified 80 linear.

Desmacidon fistulosa, Bowerbank.

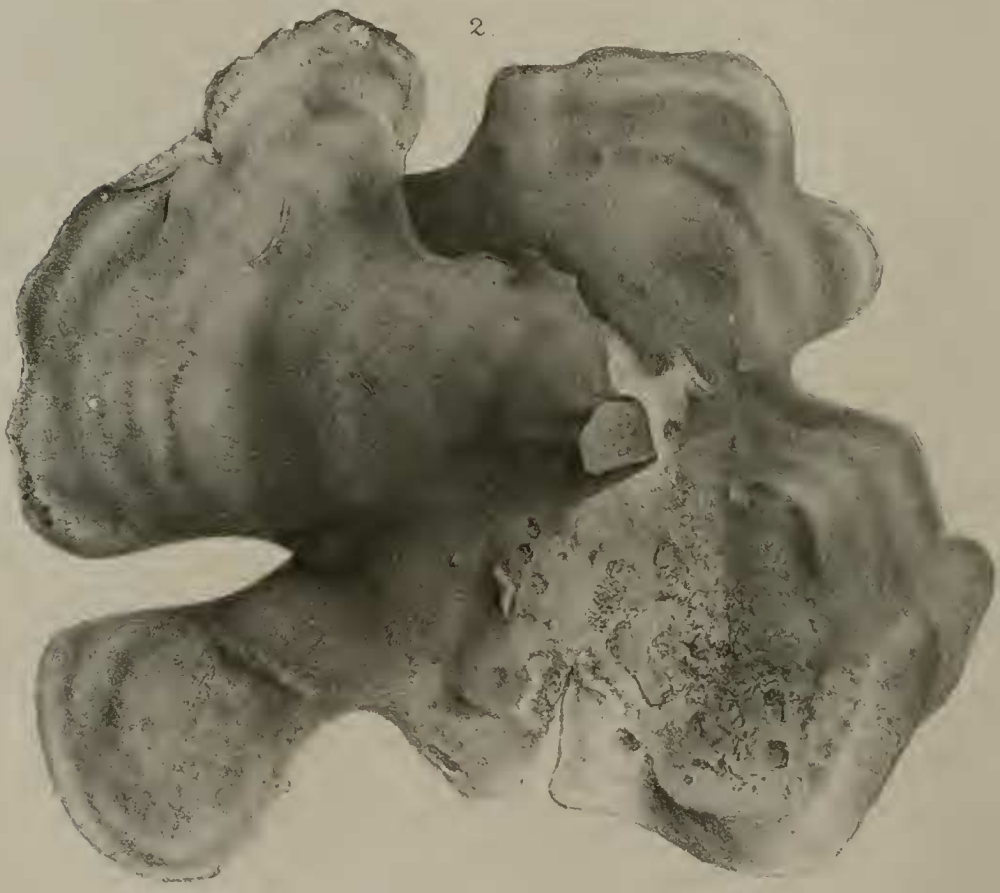
Fig. 7 represents the type specimen, natural size.
Fig. 8. One of the skeleton-spicula, magnified 150 linear.

Ciocalypta Tyleri, Bowerbank,

Fig. 9. The type specimen, natural size,

1

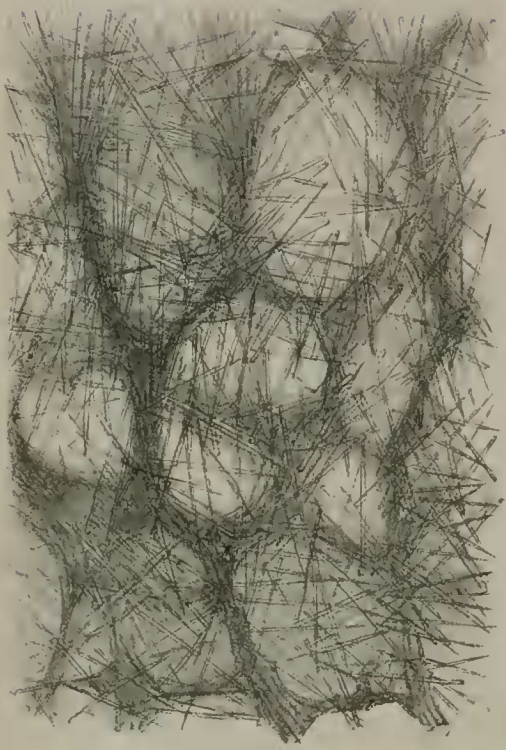
2

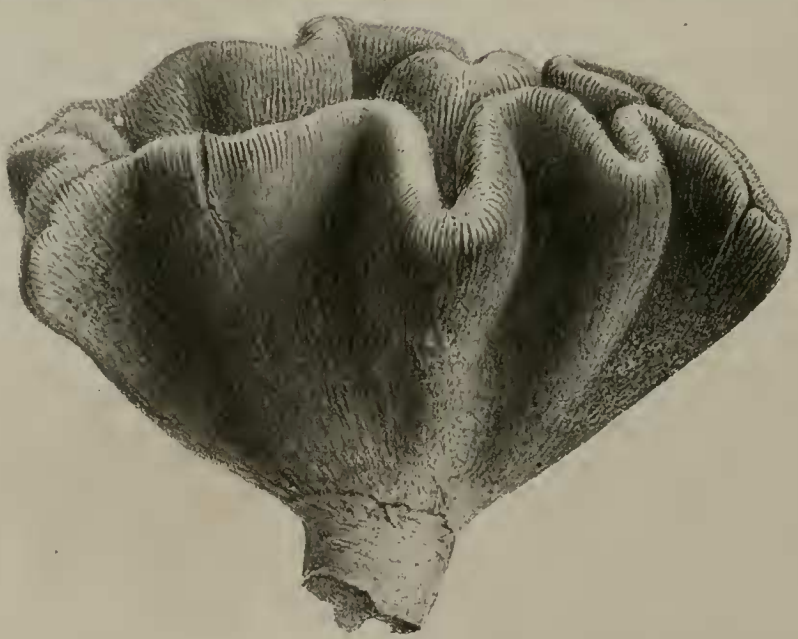


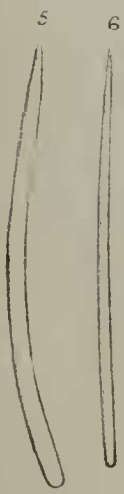
Spongionella Holdsworthii.

W. Lens Aldous del et lith

W. West & Co. imp.

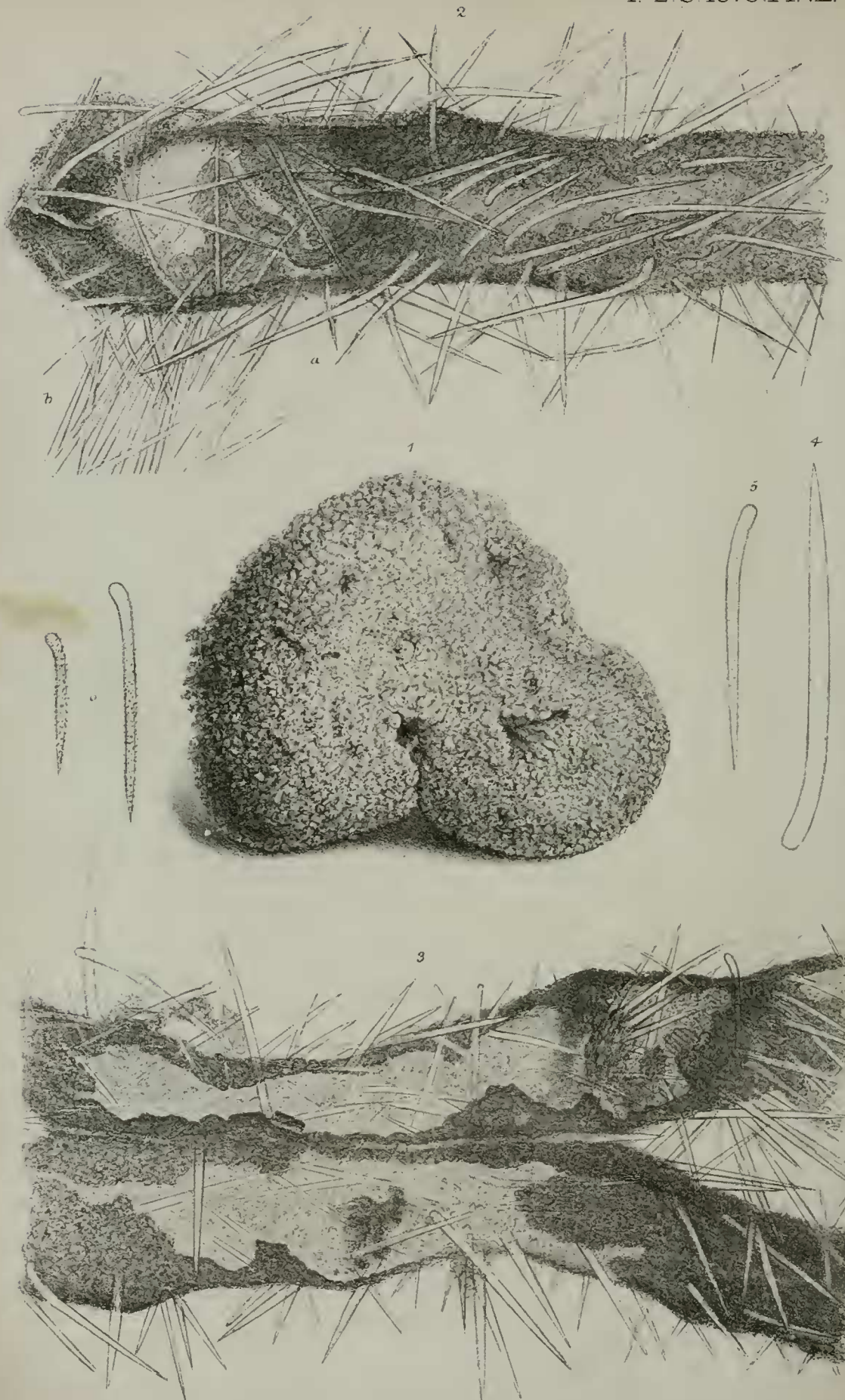






Dysidea conica 1. Isodictya Donnani 2–6. Spongionella Holdsworthii 7

W. Lens Aldous del. et lith
W. West & Co. imp



Halyphysema tubulata.

W. Lens Aldous del. et lith.

W. West & Co. imp.

Fig. 10. One of the small slender acerate spicula of the dermal membrane, magnified 123 linear.
Fig. 11. One of the small skeleton-spicula intermingled with the slender acerate spicula of the dermal membrane, magnified 123 linear.
Fig. 12. A full-sized skeleton-spiculum, magnified 123 linear.

2. Report on a Collection of Sponges found at Ceylon by E. W. H. Holdsworth, Esq. By J. S. Bowerbank, F.R.S., F.Z.S., &c.

(Plates V.–VII.)

[Received November 6, 1872.]

On the return of Mr. Holdsworth from Ceylon, in 1871, he brought with him a small collection of Sponges which he obtained at the Pearl-banks and from the beach near his house at Aripo, on the north-west side of the island. The total number is 25 specimens; many of those from the beach were in a condition in which specimens thus obtained are usually found, either well-washed skeletons, or so much deteriorated as to have destroyed a considerable portion of their softer parts, on which their specific characters frequently depend. I examined the whole of the specimens; and the following is a list of the genera and the number of species of each:—*Chalina* 11 specimens, consisting of 7 species; *Spongia* 6 specimens, of 3 species; *Stematumenia* 2 specimens, of 1 species; *Dysidea* 2 specimens, of different species; and 1 species each of the following genera, *Halichondria*, *Desmacidon*, *Isodictya*, *Spongionella*, and *Haliphysema*. The last three of these species and one *Dysidea* are not only in a fine state of preservation, but they also possess more than the usual degree of interest from the singularities and beauties of their structural peculiarities, as well as from having been hitherto unknown to science; and I have therefore selected these species for description and illustration.

Spongionella Holdsworthii, Bowerbank. (Plate V.)

Sponge cup-shaped, margin entire or lobed; parietes very thin; pedestal short and stout; surface smooth and even. Oscula simple, rather equally dispersed; orifices circular, or more or less radiating; pores inconspicuous. Dermal membrane thin and pellucid. Skeleton—primary lines regular, comparatively stout; secondary lines rather irregular, slender.

Colour in the living state dark brown, like dirty leather (*Mr. Holdsworth*).

Hab. Nine-fathom line, or western margin of the great Pearl-bank off Aripo, Ceylon (*Mr. Holdsworth*).

Examined in the dried state.

I received five specimens of this interesting species of sponge for examination from my friend Mr. Holdsworth. They were all of nearly the same size as the one represented by figs. 1 & 2, Plate V.

The normal form is that of a thin, more or less expanded cup, sometimes cleft at the edges, as in the one figured; in others the margin is quite perfect; and in all the pedicle is very short and slightly expanded, and the substance of the parietes of the sponge is equally thin and delicate, so thin that if it be held up to the light the radial structures of the primary lines of the skeleton may be readily seen by the aid of a lens of two inches focus; the margin of the cup is very little thicker than a stout sheet of paper, and even near the base it rarely exceeds a line in thickness.

The oscula are dispersed on the inner surface of the cup, at nearly equal distances from each other. The circular ones rarely exceed half a line in diameter. In many cases, instead of the usual circular form, they consist of three or four narrow shallow lines radiating from a centre. This variation in their form is remarkable, and I do not recollect ever having seen the like of it before.

I could not detect the pores on any of the portions of the outer or inhalant surface of the sponges which were examined. The dermal membrane is very thin and delicate in its structure.

The primary lines of the skeleton are very much stouter than the secondary ones. They do not radiate in strictly straight lines, and frequently meander to some extent in their course; but their general direction is distinctly in lines radiating from the central basal attachment of the sponge.

Mr. Holdsworth, in a letter to me descriptive of its locality, states as follows:—"*Spongionella* is only found on the 9-fathom line of the large pearl-bank. It is attached to pieces of dead coral or stones. When alive it is of a dark brown; and when taken out of the water it looks exactly like dirty wet leather. If you soak a bit of one of the dark specimens you will see it with as nearly as possible the original appearance.

"This sponge is so strictly confined to the locality above mentioned, that its discovery by the divers is considered the strongest evidence that the outer part of the bank has been reached.

"I should mention that the banks, strictly speaking, are only beds of gravel, stones, and dead shells in the midst of the general sea-bottom of fine white sand, and the water is as deep over them as in the neighbourhood."

DYSIDEA CONICA, Bowerbank. (Plate VI.)

Sponge conical, pedicelled; surface covered with small acutely conical papillæ. Oscula simple, large, dispersed. Pores inconspicuous. Dermal membrane thin, pellucid, abundantly arenulous. Skeleton fibro-membranous, unsymmetrical, abundantly arenulous. Interstitial membranes aspiculous.

Colour in the living and dead state—pedestal light grey, conical mass dark purple.

Hab. Large Pearl-bank, Ceylon, in 8 fathoms (*Mr. Holdsworth*). Examined from spirit, as it came from the sea.

This interesting little species of *Dysidea* was dredged up by Mr.

Holdsworth from the 8-fathom part of the Great Pearl-bank at Ceylon. It was immediately immersed in spirit; and my friend states that it "has not appreciably altered in appearance, shape, or colour since I first took it in my hand. It is the only one of the kind I have seen."

The regular conical form of this species is very characteristic, as I do not know any other species of the genus, either British or foreign, that has any well-defined form. The surface characters also are unlike those of any other known species.

The internal structure very closely resembles that of our British species *D. fragilis*, exhibiting precisely the same mode of increment that I have described in my 'Monograph of British Sponges,' vol. i. pp. 78 & 211, figs. 270–272, as prevailing in that species. The skeleton-structure is more membranous than fibrous, the latter being frequently more like thickened membranous edges than true fibres, with the membrane extending between them. Most frequently the membranous extensions are completely covered by a single stratum of particles of sand firmly cemented to them, which are so closely packed as to completely resemble a piece of fine mosaic work; and no artist could adjust the positions of the large and small pieces of sand with greater precision than that exhibited on the membranes of the sponge. There is something more than the mere adhesion by chance in the attachment of the grains of sand to the membrane. The close and accurate adjustment of the particles to each other, the filling in of all the angles as completely as the most careful workman in mosaics would have adjusted them to each other, plainly indicate something more than a mere dispersion of the grains over the membranous surface. We find the fibres projected from the mass of the sponge in search of grains of sand with which to form the artificial skeleton of the animal; and it is but a step further in the organization possessed by the animal to imagine that this beautiful arrangement of the particles of sand on the membrane is achieved by the contractile power that we know those tissues to possess. It is well known that they can contract any portion of their own substance, and thus open pores for the imbibition of nutriment, and, if alarmed, again close them so completely that their very position becomes invisible; and it is but a step further to believe that the same description of voluntary contractile power has enabled them so to operate by contractions of the tissue as to bring every molecule of sand cast upon its surface into close conjunction with each other in the complete and beautiful manner that obtains in this sponge, and thus form the exquisite mosaic arrangement that may be seen on its membranes.

If we are to judge by the amazingly various and beautiful structures exhibited in the sponges, we must certainly credit them with an amount of instinctive power they have hitherto never been imagined to possess, and assign them a much higher position amidst the lower animals than they have hitherto been supposed to merit. Occasionally there are spots of interstitial membrane unoccupied by grains of sand; and these were abundantly furnished with lenticular nucleated cells of rather unequal sizes, the nucleus being visible in the largest ones only.

Where the true fibre prevails, and the increment of the skeleton is progressing, a single thread may be seen projected from the outer surface of a grain of sand, to some distance, without having met with a grain to which it could attach itself, and at its distal extremity there will be seen a single large or small molecule of sand elevated, as it were, on a pedestal, or an irregular cup-shaped membrane which has only partially enveloped a particle and then lost it; or a column of large and small grains will be seen projected from the mass, the distal grain of which always exhibits more or less extensions of keratose tissue in search of additional grains of sand to be incorporated in the fibrous skeleton of the sponge.

The dermal membrane is thin and pellucid; it is covered with a single stratum of grains of sand and a few foraminated shells; in the interstices of these grains a few open pores were visible.

The oscula are variable in size; ten or twelve were dispersed over the surface of the sponge; the largest rather exceeded a line in diameter.

Isodictya Donnani, Bowerbank. (Plate VI.)

Sponge cup-shaped, parietes thick and strong; margin strongly undulated, distal edge finely plicated, surface externally and internally even, minutely hispid. Oscula and pores inconspicuous. Dermal membrane abundantly spiculous; spicules the same as those of the skeleton, and very small and slender acuate ones, dispersed. Skeleton—primary lines multispiculous, strongly developed, rather irregular; secondary lines very irregular, varying from multispiculous to unispiculous, very numerous; spicula acuate, short and stout. Interstitial membranes abundantly spiculous; tension-spicula acuate, small and slender, dispersed, rather numerous. Sarcode dark amber-colour.

Colour, alive, bright orange; dark purple in the dried state.
Hab. Pearl-banks, Ceylon (*Mr. Holdsworth*).
Examined in the dried state.

I have named this species after Capt. Donnan, the present Superintendent of the Pearl-banks.

I received a single specimen of this interesting sponge from Mr. Holdsworth for examination. The parietes of the cup are remarkably firm and thick; and at about half its height from the distal end of the short pedicle the undulation of the marginal portion of the cup commences, and increases to such an extent as to occupy at least two thirds of its entire diameter. The extreme edge of the cup is thick and rounded, and is plicated in such a manner as to closely resemble the distal end of a lady's fan when in a closed condition. The short basal column does not exceed half an inch in height in its present condition. It has every appearance of having been broken from its natural attachment while in a living state.

The surface of the outer and inner portions of the cup are even, but not smooth to the touch, from the projection of the terminations of the primary lines of the skeleton. The hispidation is visible only

when examined microscopically. It is produced partly by the extension of the primary lines of the skeleton, and partly by the projection of single spicula, of the same size and form as those of the skeleton, through the dermal membrane. I could not detect either oscula or pores on any parts of the external surface; and it is very possible that inhalation takes place on the outer surface, within the folds of the plications of the skeleton-tissues, and that the excurrent streams are ejected on the inner surface in a similar manner. And this mode of inhalation and of exhalation is the more probable as these plications are distinctly visible to the unassisted eye for about half an inch downwards on the outer surface, and to twice as deep on the inner one. The plications are composed of closely packed parallel thin plates of the sponge-tissue, all disposed at right angles to the dermal surface; but this regular arrangement of the skeleton-tissues does not seem to obtain beyond the limits stated above; the lower portions of the skeleton-structure appear to meander in every possible direction.

The dermal membrane does not spread uniformly over the surfaces of the sponge, but it appears to follow and encase the plications of the skeleton; and I could obtain a view of it only on the surface of the plates, and on the terminations of the defensive prolongations of the primary lines of the skeleton projected from the external surface of the sponge, when mounted in Canada balsam, and with a power of about 80 linear. On those parts it was abundantly supplied with the slender tension-spicula, intermixed with which were a considerable number of the larger or skeleton-spicula.

The skeleton is very strongly developed. The primary lines frequently throw off branches which pursue their course in lines parallel to the parent branch. This habit, in conjunction with the great irregularity in the size and mode of disposition of the secondary lines of the skeleton, often produces a considerable amount of confusion among the skeleton-structures.

I have never observed the same singularly plicated form of the skeleton-tissues in any other species of *Isodictya* with which I am acquainted.

Mr. Holdsworth, in his letter to me, writes:—"The dark, thick, cup-shaped sponge with undulated margin is not uncommon on the large pearl-bank in from 6½ to 9 fathoms; and I have met with it once or twice on rough ground on other parts of the coast; it is usually attached to some bit of rock, and is always, when alive, of a uniform bright orange-colour. It turns black an hour or two after being taken out of the water. The largest specimen I have seen was about as large again as the one you have. The general shape and colour are always the same."

HALIPHYSEMA TUBULATUM, Bowerbank. (Plate VII.)

Sponge massive, sessile. Surface minutely mamillated. Oscula and pores inconspicuous. Dermal membrane obsolete. Skeleton composed of numerous single and separate cylindrical tubuli radiating from the base to the surface of the mass; tubuli closed, termi-

nating more or less hemispherically, furnished abundantly with large and small defensive and skeleton-spicula projected from all parts of their surfaces at various angles; large skeleton-spicula flecto-attenuato acuate, stout and strong, usually procumbent on the tubuli; small defensive spicula subflecto-attenuato acuate, incipiently spinous, small and slender. Interstitial spicula the same as those of the skeleton, dispersed, numerous. Sarcode blood-red.

I received this very remarkable sponge among the series of specimens from Ceylon, collected by Mr. Holdsworth. There is no other genus with which I am acquainted to which it can be referred but *Haliphysema*. The only two species known and described are remarkably small, one consisting of a single simple fistulous skeleton, and the other of a ramous fistulous one; the species under consideration consists of a congregation of numerous single fistulæ. Although varying from each other greatly in size, there is a perfect accordance in the principle of their skeleton-structures, all of them exhibiting the tubular form, with the distal termination closed and more less dilated, that especially characterizes the genus.

There are no distinct indications of any recent attachment of the sponge. The position of its natural base is indicated by the convergence of the skeleton-tubes at their proximal extremities; and it is probable that the specimen had been freely floating about in a living condition for some time before it was taken.

There are several large irregular openings on the upper surface of the sponge, which extend deeply into its mass. These orifices have none of the characters of excurrent or cloacal ones. As the internal structures, both in form and mode of disposition, strongly indicate a carnivorous habit in the sponge, it appears highly probable that these large irregular orifices are provided for the double purpose of the admission of water to its tubuli and to allow of the free entrance of minute annelids and other similar prey on which it subsists.

The skeleton-tubuli are not closely packed together, and there is frequently a considerable space between them; and the projection of the defensive spicula from their surfaces maintains this separation from each other, their adherent connexion being accomplished by a loose arrangement of interstitial skeleton-spicula, between which there is ample space for the admission and flow of water amongst the skeleton-tubes.

If this reading of their history from their structure be correct (and it is quite in accordance with what we know to occur in other carnivorous sponges abounding in especial organs for the destruction of intruders within their interstitial cavities), the inhalation through the parietes of the tubes will be as in the other species of the genus, and the excurrent streams will take place in their natural positions at the distal ends of the tubes, which project from the surface of the sponge, and form the numerous minute mamillæ of the dermal surface.

On fig. 2, Plate VII., representing a single skeleton-tube, near the distal end, at *a*, there is a minute, rather long and very sinuous tube or skin of what appears to have probably been a slender annelid.

Its diameter very slightly exceeds that of one of the large spicula of the sponge; and its figure, full of contortions, is just such as we may imagine that of a dying, struggling, slender worm would have been under such circumstances. It is so far covered and partially hidden by the surrounding sarcode, and so completely emptied of its former contents, that nothing but its form is distinctly visible; but be it what it may it is certainly no part of the organization of the sponge.

It is no uncommon event to find in living sponges such slender worms attempting to prey either on the dermal surface or on the interstitial membranes within the sponge.

With such a structure as that of the specimen in course of description, a common investing dermal membrane could scarcely be supposed to be required or to exist, and the true dermis must be sought at the external surface of each of the skeleton-fistulæ; but as these organs are so small and their parietes so thin, it is extremely difficult to discriminate the dermal tissue from the parietes of the fistulæ. In some of the specimens mounted in Canada balsam, their surfaces are frequently much obscured by sarcode; but in some parts there are strong indications of a very delicate dermal membrane enveloping the fistula.

Some of the large flecto-acuate spicula are procumbent and closely adherent for the whole of their length to the surface of the fistulæ. They are disposed in lines more or less in accordance with its long axis; and in this position they perform the office of skeleton-spicula, strengthening and supporting the delicately constructed fistula by their longitudinal position on its surface, and maintaining it in its normal position; while others of them are projected as defensive organs from its surface. Very few of the small incipiently spinous defensive spicula are seen to be procumbent; and by far the greater number are projected backward at various angles to the surface of the fistula.

The direction in which both descriptions of defensive spicula are projected from the surfaces of the fistulæ is more frequently backward than forward, or at right angles to the surface. This seems to indicate that they are carnivorous feeders, and that this position of the spicula is destined to obstruct the egress of any small annelids that may have entered the body of the sponge, and to destroy them for its own nutrition.

No adventitious substances are incorporated with the skeleton of this species as in the other two known ones, and all its spicula are undoubtedly secreted by itself; and in every respect it forms the best type of the genus *Haliphysema* with which we are acquainted.

DESCRIPTION OF THE PLATES.

Plate V.

Spongionella Holdsworthii.

Fig. 1. The type specimen, natural size, exhibiting the numerous oscula within the cup or upper surface of the sponge.

Fig. 2 represents the outer or inhalant surface of the sponge, with the remaining portion of its short pedicel.
For its anatomical structure see Plate VI. fig. 7.

PLATE VI.

Dysidea conica.

Fig. 1. The type specimen, natural size.

Isodictya Donnani.

Fig. 2 represents the type specimen, natural size.
Fig. 3. A section, at right angles to the dermal surface, exhibiting the skeleton-reticulations and the interstitial membranes and their spicula, magnified 80 linear.
Fig. 4. One of the very small acuate spicula from the dermal membrane, magnified 250 linear.
Fig. 5. A full-sized skeleton-spiculum, magnified 250 linear.
Fig. 6. One of the smaller skeleton-spicula from the interstitial membranes, magnified 250 linear.

Spongionella Holdsworthii.

Fig. 7 represents a small portion of the keratose skeleton of the sponge from the thinnest part of the distal margin, magnified 80 linear.

PLATE VII.

Haliphysema tubulatum.

Fig. 1 represents the type specimen, natural size.
Fig. 2. The distal portion of one of the skeleton-tubuli and its numerous skeleton- and defensive spicula, with the remains of, apparently, the skin of a minute annelid at *a*, and a small portion of the interstitial spicula at *b*: magnified 80 linear.
Fig. 3. Portions of two of the skeleton-tubuli from near the middle of their length, showing their loose and tortuous course, and their interior structure through longitudinal sections of the tubuli: magnified 80 linear.
Fig. 4. One of the largest skeleton- and defensive spicula, magnified 150 linear.
Fig. 5. A small-sized skeleton- and defensive spiculum, magnified 150 linear.
Fig. 6. Two of the small subflecto-attenuato-acuate incipiently spinous defensive spicula, magnified 150 linear.

3. Note on the Occurrence of *Xenospongia patelliformis*, Gray, on the Coast of Ceylon. By E. W. H. HOLDSWORTH, F.L.S., F.Z.S.

[Received January 7, 1873.]

This curious form of sponge was described and figured by Dr. Gray in the 'Proceedings' of this Society in 1858, p. 229, pl. xii., from two dried specimens received from Torres Straits; and, so far as I can discover, no other locality was known for it until I fortunately met with a single young example on the Ceylon pearl-bank. This specimen was obtained from a depth of about 8 fathoms, on a sandy part of the bank; and, knowing that an opportunity of examining this sponge in as nearly as possible its natural condition was desired at home, I at once put it in spirit, and on my return to England placed it in the hands of Dr. Gray.

It is not easy to understand the causes of the geographical distribution of many marine animals. Temperature and depth of water have no doubt much to do with it in many cases, as, for instance, with the various kinds of corals; and such causes may have their influence on the range of this sponge; but it is interesting to note that of the two known localities for it, one of them (Torres Straits) is in lat. 10° S., and the other (the Ceylon pearl-banks) is in lat. 9° N. The temperature of the Ceylon seas varies but little from 82° Fahr.; and that is, I believe, about the warmth of tropical waters in general, unless influenced by some polar current. The apparent absence of this sponge from the intermediate equatorial sea is therefore due probably to the little use that has yet been made of the dredge in the waters between India and Australia, rather than to any difference in the physical conditions of life there; and if the Deep-Sea Dredging-Expedition does not meet with it in that as yet little-explored region, the localization of the genus *Xenospongia* at short and almost equal distances north and south of the equator will be rather remarkable.

This sponge is not mentioned by Dr. Bowerbank in his report on my collection of Ceylonese species, as the specimen was sent to the British Museum, and did not come into his hands for examination.

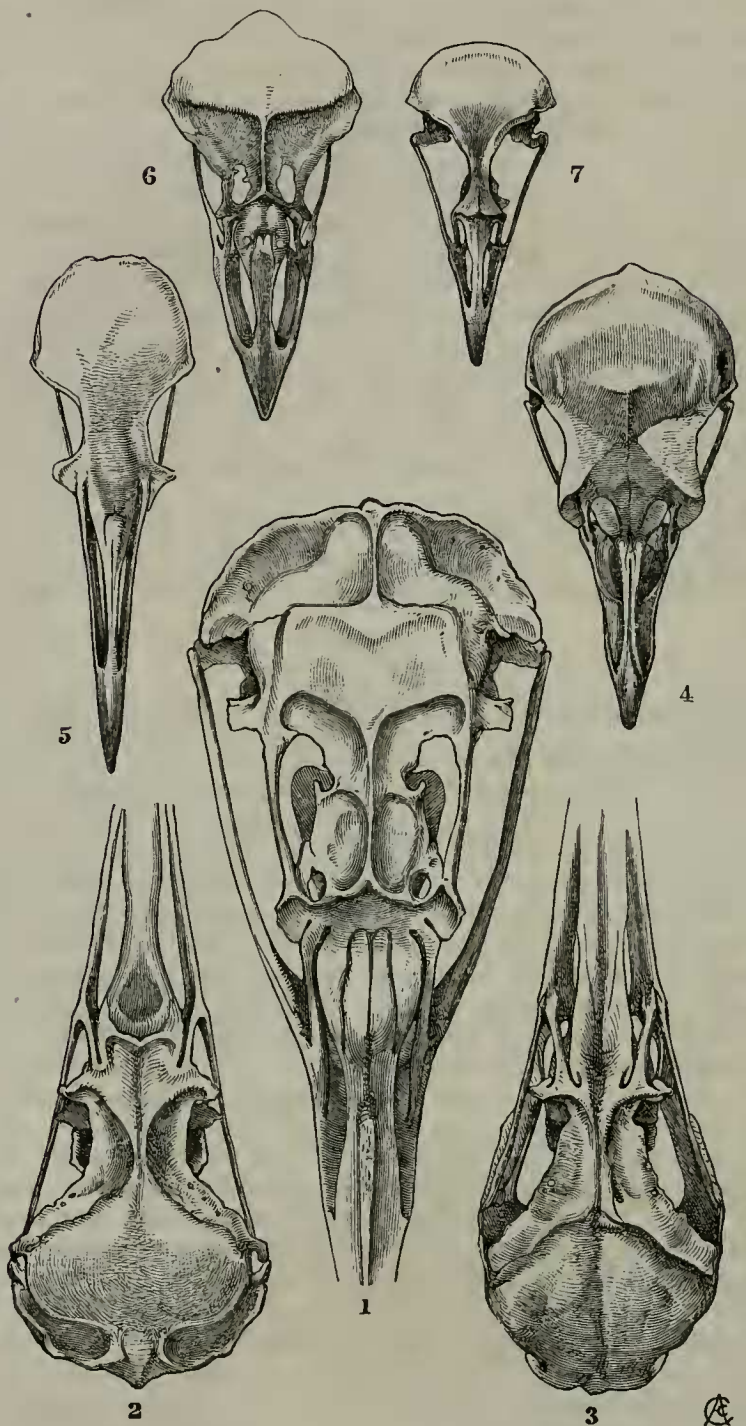
4. On the Value in Classification of a Peculiarity in the Anterior Margin of the Nasal Bones of certain Birds. By A. H. Garrod, B.A., F.Z.S., Prosector to the Society.

[Received December 3, 1872.]

Since commencing the study of the anatomy of birds, it has always appeared to me that two distinct types of nasal bones can be distinguished among them without difficulty—and that if those which present the abnormal characters are considered separately, they present other features in common which justify their being placed in the same class, and their entire separation from those which present the less-modified arrangement.

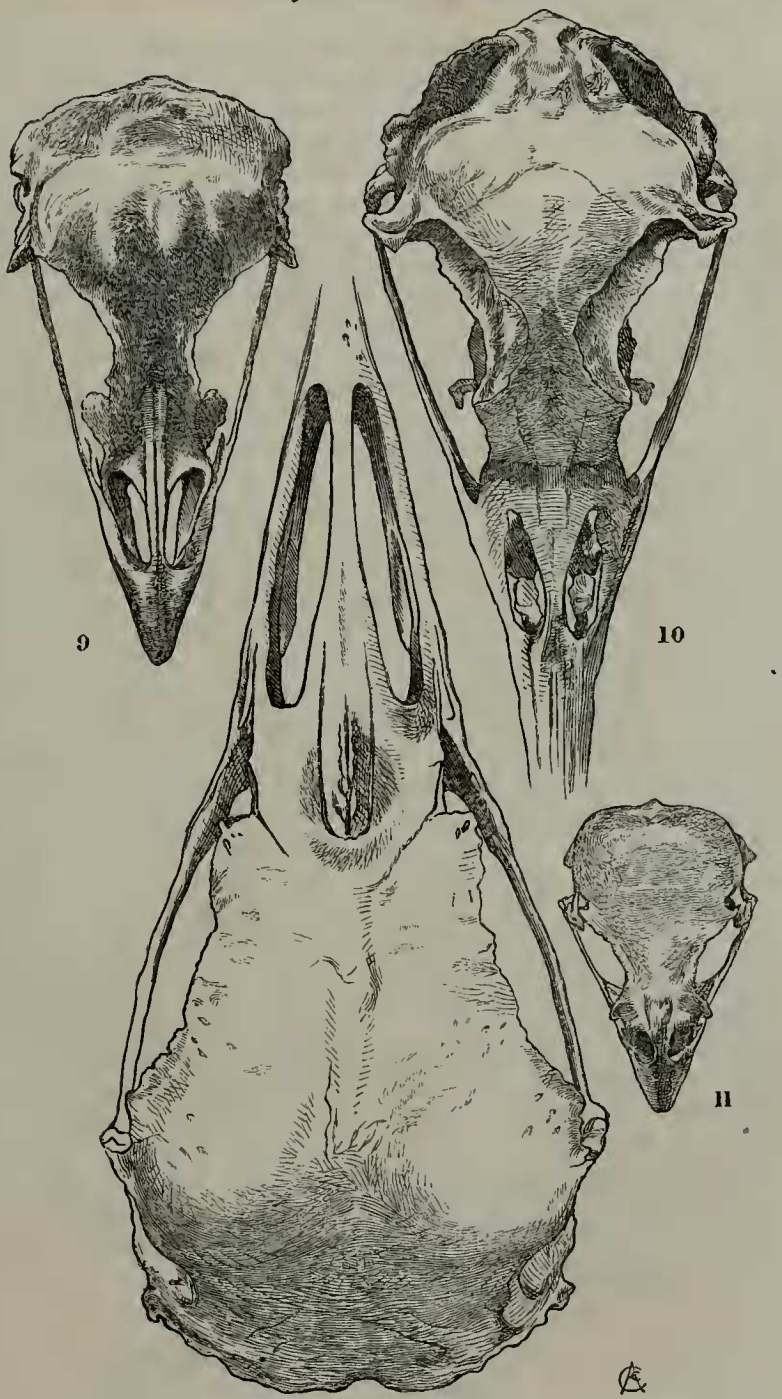
In most birds the anterior margin of the nasal bone is concave, with the two cornua directed forwards—one along the outer edge of the nasal splint of the præmaxilla, to form the inner margin of the osseous external nares, whilst the other, which is free, descends as part of the external boundary of the same aperture in connexion with the ascending process of the maxilla, which it joins. These two processes become continuous behind with the body of the bone, and with one another, there being no interruption of any kind between them. Such a condition is found in its simplest form in *Otis* and the Gallinæ proper; and birds possessing the bone so constructed may be termed *holorhinal*: in them a transverse straight line, drawn on the skull from the most backward point of the external narial aperture of one side to that of the other, always

Skulls of Schizorhinal Birds.



1. *Alca impennis.*
2. *Larus argentatus.*
3. *Numenius arquatus.*
4. *Columba livia.*
5. *Parra (Hydralector) cristata.*
6. *Aretica alle.*
7. *Pedionomus torquatus.*

Skulls of Holorhinal Birds.



8. *Otis tarda.*
9. *Gallus domesticus.*
10. *Daption capensis.*
11. *Coccothraustes vulgaris.*

passes in front of the posterior terminations of the nasal processes of the præmaxillæ.

But several birds present a very different condition. In *Grus*, for example, the posterior contour of the osseous external nares, instead of being rounded, as in holorhinal birds, is apparently formed by the divergence of two straight bars of bone, which enclose an angular space between them. These two processes evidently correspond to the two anteriorly directed cornua of the holorhinal skull described above; but they appear in many cases to be so different in density, and the outer one joins the body of the bone so abruptly, that it seems at first sight to be an independent ossification; however, I have no reason to believe that such is the case. As in holorhinal birds, so in those under consideration, which may be termed *schizorhinal*, the internal process of the nasal bone runs forwards along the outer border of the nasal process of the præmaxilla, and the outer descends free to join the maxilla. In these birds there is considerable variation in the manner in which the almost detached outer of the two nasal processes joins the body of the bone. In *Numenius*, *Hæmatopus*, and many of the Limicolæ they proceed directly upwards and expand, becoming slightly fanned out where they join the rest of the bone by a straight transverse line. In *Ibis* and *Grus* they are of uniform size from end to end, whilst in the Auks, and to a less degree in the Gulls, at its origin the process is slightly curved, being directed outwards for a short distance, and after that straight downwards and forwards.

In most schizorhinal birds, a transverse line joining the extreme posterior point of one external nasal aperture to the similar one of the opposite side is situated behind the posterior ends of the nasal processes of the præmaxilla; but in some of the short-beaked, broad-mouthed species of the class it is situated in front of them. Such is the case in *Pterocles* and *Syrrhaptes*; and this peculiarity renders it at first sight uncertain whether they are schizorhinal at all; but as every intermediate condition may be found between the strictly schizorhinal skull of the Columbidæ proper, and the very similar but less strongly marked skull of *Pterocles*, there is no real reason to doubt that the modification only depends on the great breadth of beak in the latter bird. The curious development of the superficial nasal turbinal bone of *Pterocles* is also a Columbine character, as is also the great length of the inner of the two nasal processes, which, in a manner quite unlike that of the Gallinæ, extends on each side for a long way forwards under the premaxillary nasal splint.

Subjoined is a list, alphabetically arranged, of the genera in which I have observed the schizorhinal arrangement:—

Schizorhinal Birds.

Alca.	*Charadrius.*	*Gallinago.*
Anous.	*Chionis.*	*Glareola.*
Anthropoides.	*Dromas.*	*Grus.*
Arctica.	*Eurypyga.*	*Hæmatopus.*
Cataractes.	*Fratercula.*	*Ibis.*

Larus.	*Pterocles.*	*Sterna.*
Lestris.	*Recurvirostra.*	*Totanus.*
Limosa.	*Rhinochetus.*	*Tringa.*
Machetes.	*Rhynchops.*	*Turnix.*
Numenius.	*Rissa.*	*Uria.*
Parra.	*Sarciophorus.*	*Vanellus.*
Platalea.	*Scolopax.*	

And all the Columbidæ proper.

From the above list it is evident that nearly all the schizorhinal birds are included among Professor Huxley's Schizognathæ. Going further into detail, they may be said to embrace all the Charadriomorphæ, with the exception of *Œdicnemus* (I have not seen *Cursorius*). Among the Geranomorphæ, they comprise the Gruidæ, together with *Rhinochetus* and *Eurypyga*, but not the Rallidæ (from which family *Parra* should be removed to the Charadriomorphæ), nor *Psophia*, *Otis*, and *Cariama*. Among the Cecomorphæ they include the Laridæ and Alcidæ, but not the Procellariidæ nor the Colymbidæ. Among the Spheniscomorphæ none are schizorhinal. Among the Alectoromorphæ *Turnix* and the Pteroclidæ are so; and the Peristeromorphæ are all schizorhinal. In the other main divisions, the Desmognathæ and the Ægithognathæ, only the Hemiglottides of Nitzsch, belonging to the Pelargomorphæ, are schizorhinal.

The linking together of the Plovers and the Gulls by any osteological feature has long been a desideratum, as Professors Newton and Huxley have remarked *; and the facts brought forward by the latter have greatly assisted in this respect. But Professor Huxley's classification does too much; it places the Petrels nearer to the Gulls than the latter to the Plovers, and it includes the Rails in the same category as the Cranes, which is more than collateral evidence justifies. If the nasal bones have the significance in classification which I would put upon them, and their conformation be employed in dividing up the schizognathous birds (with which, notwithstanding their desmognathism, *Platalea* and *Ibis* must be placed), a result is arrived at which pterylosis and internal anatomy greatly tend to justify.

The following table represents my idea of such an arrangement, though I do not wish to give my sanction to the naturalness of the non-schizorhinal schizognathous group, which I believe to be open to criticism :—

Schizognathous Birds (Huxley) + Hemiglottides (Nitzsch).

Schizorhinal Birds.

1. Columbæ, Pteroclidæ, and Turnicidæ.
2. Limicolæ (excluding *Œdicnemus*, and including *Parra*).
3. Laridæ.
4. Gruidæ.
5. Eurypygidæ and Rhinochetidæ.
6. Hemiglottides.
7. Alcidæ.

* Ibis, 1868, pp. 92 & 360.

Holorhinal Birds.

1. Impennes.
2. Procellariidæ.
3. Colymbidæ.
4. Gallinæ (excl. *Pterocles* and *Turnix*).
5. Rallidæ (excl. *Parra*).
6. Otidæ (incl. *Œdicnemus*).
7. Cariamidæ.
8. Psophiidæ.
9. Opisthocomidæ.
10. Podicipidæ.

In his paper "On the Osteology of the Kagu," Mr. Parker, in speaking of the nasal bone, says, "this part of the face is thoroughly Gruine in both the *Eurypyga* and the Kagu; the long open nasal fossa, so sharp above at the bifurcation of the nasals, gives a character to the face common to large groups of Grallæ and Palmipeds." Otherwise he does not employ this character in classification, as is evident when it is seen that he places the Kagu close to *Psophia* and the Rails, which are holorhinal birds.

It may be mentioned that the external nasal process of the nasal bone is weak or obsolete in the struthious birds.

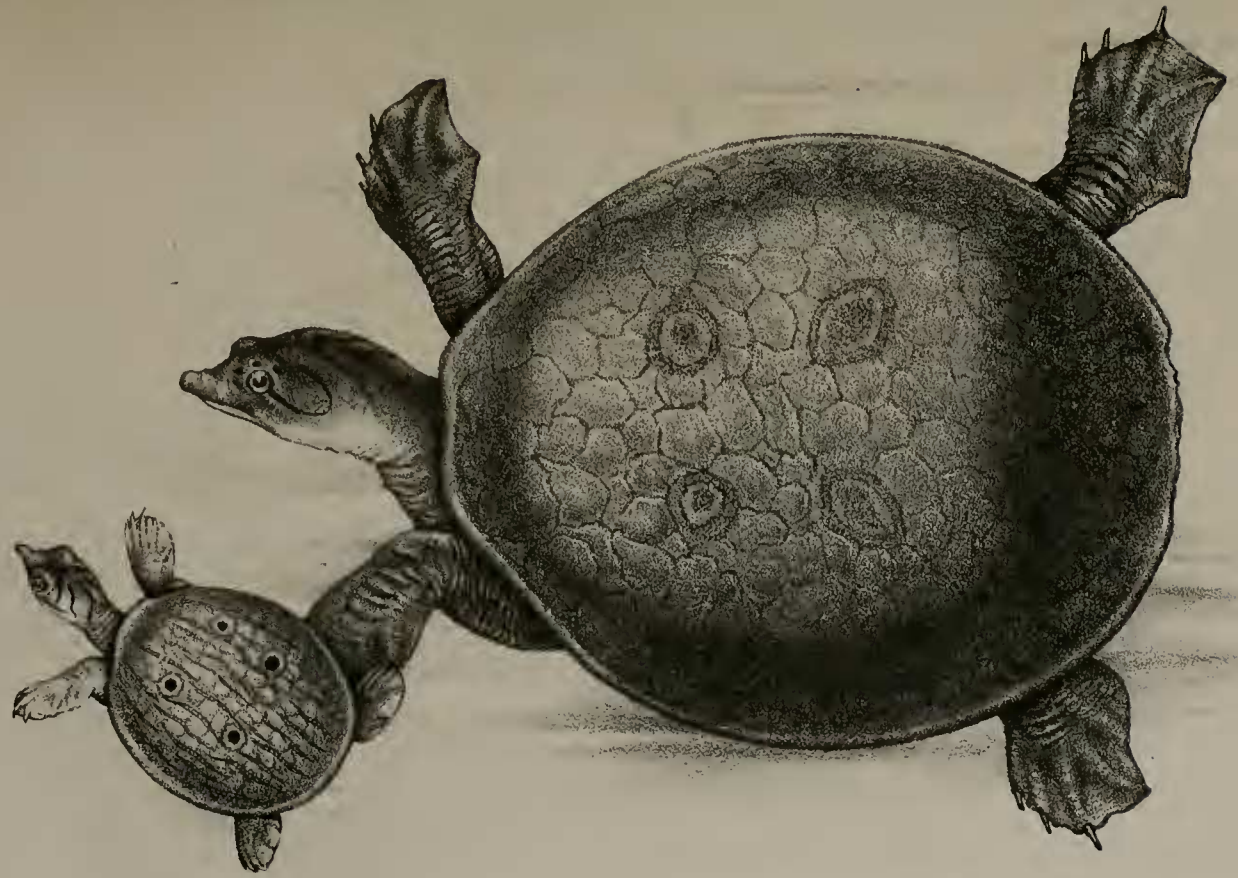
5. Notes on Mud-tortoises (*Trionyx*, Geoffroy), and on the Skulls of the different kinds. By Dr. J. E. Gray, F.R.S. &c.

[Received Oct. 16, 1872.]

(Plate VIII.)

The distinction of the species of this group of Tortoises is attended with considerable difficulty, on account of the change of colour and of the development of bones and of the callosities on their surface during the growth of the animal. After considerable study, I am satisfied that the skulls, which appear to alter very little during the growth of the animal, are among the best characters for the distinction of the species, and division of them into groups; but the study of these parts has been attended with great difficulty, from the want of materials and so little being known of their development; and it was not until I had made one or two mistakes that I came to the conclusion that they afforded such good characters, and varied so little during the growth of the species.

The study of the skulls is attended with considerable difficulty, from the want of specimens; and the result has shown that the only safe way of comparing them is actually by skulls with skulls. I at first thought that it might be done by examining the mouths of animals in spirits or dry; but the skin on the side of the mouth hides so much of the skull, and gives the palate quite a different character from that which exists in the skull; and the examination of the mouth



G. Berjeau lith

Mintern Bros imp

TRIONYX GANGETIGA.

of specimens in this state only affords a general impression of the alveolar surface.

The skulls of the Mud-tortoises are so uncommon, and I was so disinclined to take the skulls out of the specimens, that I availed myself of the characters which the preserved heads afforded me: but I have now determined to extract the skulls in the most careful manner from the specimens themselves; and this has given me a greatly increased knowledge of the species, and of the characters the skulls afford.

The examination of the skulls of the different specimens has had the effect of putting together specimens that had been considered not only distinct species but distinct genera, and has shown them to be only various ages of the same species, as *Dogania* and *Sarbieria*; and at the same time it has given more important characters for the separation of species and characteristics for the groups to which they belong.

In all the other groups of Tortoises I have only figured the skulls that belonged to skeletons; but in this group of Mud-tortoises the number of skulls that I had was so small, that I was induced to figure and try to identify two skulls which Prof. Oldham had given to the Museum with two Asiatic species: and I am sorry to say that now we have been able to examine other skulls, one of them has been proved to have been wrongly identified; that is to say, that which I figured for *Potamochelys* proves to be the skull of an *Emyda*.

In my former papers I had only the opportunity of examining the skulls of most of the species in the heads of the stuffed specimens, or of those preserved in spirits, and which consequently had the horny coat to the alveolar process of the jaws and palate, which are naturally very different from the bones which they cover. All the skulls described in this paper have been extracted from the specimens, and have had the horny coat of the alveolar surface removed. This explains why they differ from descriptions in former papers; and those in this paper are to be considered the most correct.

There is a very great difficulty in comparing animals in spirits with prepared dry specimens. The living animals and the specimens in spirit have the bony disk of the back and sternum covered with a thick skin, which, perhaps with the exception of very old specimens, entirely hides the callosities on the surface of the back and part of the sternum, which are so prominent, and from which we take many characters in the dry preserved and stuffed specimens. The rugosity or callosities seem to cover the lateral bones of the sternum simultaneously over the whole surface, except the diverging rays by which the bones are united. In the hinder pair of sternal bones the callosities form a rounded or oblong spot near the internal side, and gradually enlarge themselves so as to cover the whole surface of the bone, leaving the diverging rays.

The genera and families have various relations to each other, which I think are well exhibited in the following Table, which shows in one view the alliance of *Heptathyra* to *Cyclanosteus*, and *Chitra*

to *Trionyx*, which have each different jaws, but common external characters.

I believe that, for the division of the *Trionychidæ* into tribes or groups, the formation of the dorsal disk affords the best character, and one which can be observed in the animal after it has passed its most juvenile state.

The following Table exhibits the affinities of the genera of the two families to each other:—

Fam. Chitradæ.	Fam. Trionychidæ.
The skull very thin, light; alveolar surface narrow.	The skull solid, thick; alveolar surface more or less wide.

I. The hinder lateral edge of the sternum narrow, exposing the hind feet. The front pair of bones of the sternum without any callosities. The front odd bone of the dorsal disk without any bone before it in the margin.

Chitraina.	Trionychina.

II. The hinder lateral edge of the sternum with flaps to cover the hind feet. The front pair of bones of the sternum with callosities. The front odd bone united to the ribs of the dorsal disk, with an oblong free bone in the margin before it.

Heptathyrina.	Emydina.

a. Dorsal disk without any posterior marginal bones.

Heptathyra.	*Cyclanosteus* &c.

b. Dorsal disk with posterior marginal bones.

Emyda.

There is great general affinity between *Heptathyra* and *Cyclanosteus*, between *Chitra* and the various genera of *Trionychina*; indeed the skull of *Callinia* has all the thinness of the skull of the *Chitradæ*, but retains the characters of the *Trionychina*. The animals of the *Chitradæ* must have very different habits and food (as proved by the form and lightness of the skull, and the weakness of the lower jaws) from the *Trionychidæ*, where the skull is generally solid, sometimes very much so, and the lower jaw very strong.

The latter must differ considerably in their food; for many have a broad expanded alveolar surface for chewing, and others, like *Tyrse*, have a sharp edge for cutting their food.

Those with the broad alveolar surface live on dead animals; the Gangetic species are said to be found often feeding on the dead Hindoos that are thrown into the river.

Family Chitradæ, Gray, Suppl. Cat. Sh. Rept. p. 89.

I. Chitraina. *Hinder lateral edge of sternum narrow, hind feet exposed; front pair of bones of the sternum without any callosities; front odd bone of the dorsal disk united to the ribs.*

Chitra.

The skull is figured in the Cat. Sh. Rept. p. 70, t. 41; P. Z. S. 1864, p. 92, f. 11 & 12; and Suppl. Cat. Sh. Rept. fig. 28.

1. Chitra indica. (The Sewteree).

Testudo chitra, B. Hamilton (Icon. ined.).

Trionyx ægyptiacus, var. *indicus*, Gray, Illustr. Indian Zool. i. t. 80, from Hardwicke's icon.

Trionyx indicus, Gray, Syn. Rept. p. 47.

Gymnopus lineatus, Dum. & Bibr. Erpét. Gén. ii. p. 491.

Sewteree, Hardwicke (icones ined. B. M.).

Chitra indica, Gray, Cat. Sh. Rept. B. M., p. 70, t. 41 (skull), P. Z. S. 1864, p. 92, figs. 11 & 12 (skull); Suppl. Cat. Sh. Rept. p. 89, t. 28 (skull); Ann. & Mag. Nat. Hist. 1872, p. 332.

Hab. India, Ganges, Nepal.

Pelochelys.

The skull figured, Gray, P. Z. S. 1864, p. 90, f. 9 & 10; Suppl. Cat. Sh. Rept. p. 91, fig. 29.

The odd bone in front of the disk very large and broad in the adult.

1. Pelochelys cantorii.

Chitra indica, Blyth, J. A. Soc. 1863, xl. p. 77; Günther, Rep. Brit. Ind. t. (badly coloured).

Gymnopus indicus, Cantor, Rept. Malacca, p. 10.

Pelochelys cantorii, Gray, P. Z. S. 1864, p. 90, figs. 9, 10 (skull); Suppl. Cat. Sh. Rept. p. 91, fig. 29 (skull).

Hab. Malacca, Aracan.

2. Pelochelys cumingii.

Pelochelys cumingii, Gray, P. Z. S. 1864, p. 90; Suppl. Cat. Sh. Rept. p. 91.

Hab. Philippine Islands.

3. Pelochelys bibronii.

Trionyx bibronii, Owen, Cat. Osteol. Spec. Mus. Coll. Surg. p. 185, nos. 951–959.

Pelochelys bibronii, Gray, P. Z. S. 1864, p. 90; Suppl. Cat. Sh. Rept. p. 91.

Hab. Australia?

II. Heptathyrina. *The hinder lateral edge of the sternum with flaps to cover the hind limbs; the front pair of bones of the sternum with callosities; the front odd bone of the dorsal disk united to the ribs, without any small oval bone in the margin before it.*

Heptathyra.

The skull figured, Gray. P. Z. S. 1864, p. 94, figs. 13, 14, 15; Suppl. Cat. Sh. Rept. p. 92, fig. 30.

The hinder sternal callosities large, rather far apart. A well-developed callosity on each side of the front pair of bones, and a small lunate callosity on the odd bone in front of the sternum.

1. Heptathyra frenata.

Aspilochelys livingstonii, Gray, P. Z. S. 1860, p. 6, t. 22 (shell).
Heptathyra frenata, Gray, P. Z. S. 1864, p. 93, figs. 13–15 (skull).
Heptathyra aubryi, Gray, Suppl. Cat. Sh. Rept. p. 93, fig. 30 (skull).
Hab. Western and Central Africa.

Fam. Trionychidæ, Gray, Suppl. Cat. Sh. Rept. p. 94.

I. Trionychina. *Hinder lateral edge of the sternum narrow, exposing the hind feet; the front pair of bones of the sternum without any callosities; the front odd bone of the dorsal disk more or less united to the ribs, without any bone in the margin before it.*

A. *Dorsal disk with a broad transverse single or odd bone in front, which is united to the rest of the disk by a straight suture in the adult; lateral and posterior pair of bones of the sternum expanded, and covered with well-developed callosities on the whole surface.*

In the young specimens the odd bone is more or less separate from the dorsal disk, but is generally narrow and transverse. As this bone becomes more developed it expands in length and breadth, and becomes nearer to the anterior edge of the first rib. As it grows larger, there are usually a couple of circular vacancies between the odd bone and the front of the first pair of ribs; but these circular cavities diminish in size as the animal increases in age, and are entirely obliterated by the development of the bones.

Synopsis of the Genera of this Tribe.

* *The central palatine groove in front of the internal nostrils narrow, linear; alveolar surface wide.*

1. Fordia. Skull depressed, broad; palate nearly flat. Africa.

2. Nilssonia. Skull high; palate deeply concave. Asia.

** *Central palatine groove in front of the internal nostrils wide, shallow, nearly as wide as the front of the internal nostrils.*

† *Front of the alveolar surface of the lower jaw wide, flat or slightly concave, generally with a central longitudinal ridge.*

3. Trionyx.

4. Isola.

†† *Front of the alveolar surface of the lower jaw deeply concave, with a narrow sharp edge, wider and concave behind; front groove of palate wide, shallow, narrower behind. The nose of the skull is conical, shorter than the diameter of the orbit.*

5. Landemania. Back convex, with a groove on each side of the vertebral line; skull elongate; lower jaw suddenly contracted in front.

6. Ida. Back keeled; skull short; lower jaw gradually tapering.

7. Dogania. Back flat, scarcely raised; skull elongate; lower jaw gradually attenuated.

*** *The central palatine groove in front of the internal nostrils broad, shallow, rather wider than, and forming a margin to, the sides of the internal nostrils.*

8. Platypeltis. The alveolar surface of the lower jaw concave, with a sharp raised outer edge, much wider in front; hinder bones of the sternum with well-developed callosities.

9. Callinia. The alveolar surface of the lower jaw narrow, sharp-edged; front of lower jaw shelving on the inner side, erect on the sides.

10. Amyda.

11. Tyrse. The central palatine groove in front of the internal nostrils broad, shallow, much wider than, and enclosing them; nose elongate.

1. Fordia.

Skull very solid, rather broad, rounded in front; nose moderate, flattened on the sides; distance between the square nose-hole and the orbit about half as much again as the diameter of the latter, which is small; palate flat; alveolar surface very broad through the whole of its length, with a very narrow slightly impressed groove from the front edge to the septum between the internal nostrils, which are on a line with the front edge of the zygomatic cavity; lower jaw very strong and thick, depressed in front; alveolar surface broad and flat in front, narrower and deeply concave on the sides, with a slight central longitudinal ridge, and with a slight concavity and one or two small pits on the sides of the middle part. Length of the skull to condyle $4\frac{3}{4}$ inches; width at condyle $3\frac{1}{4}$ inches.

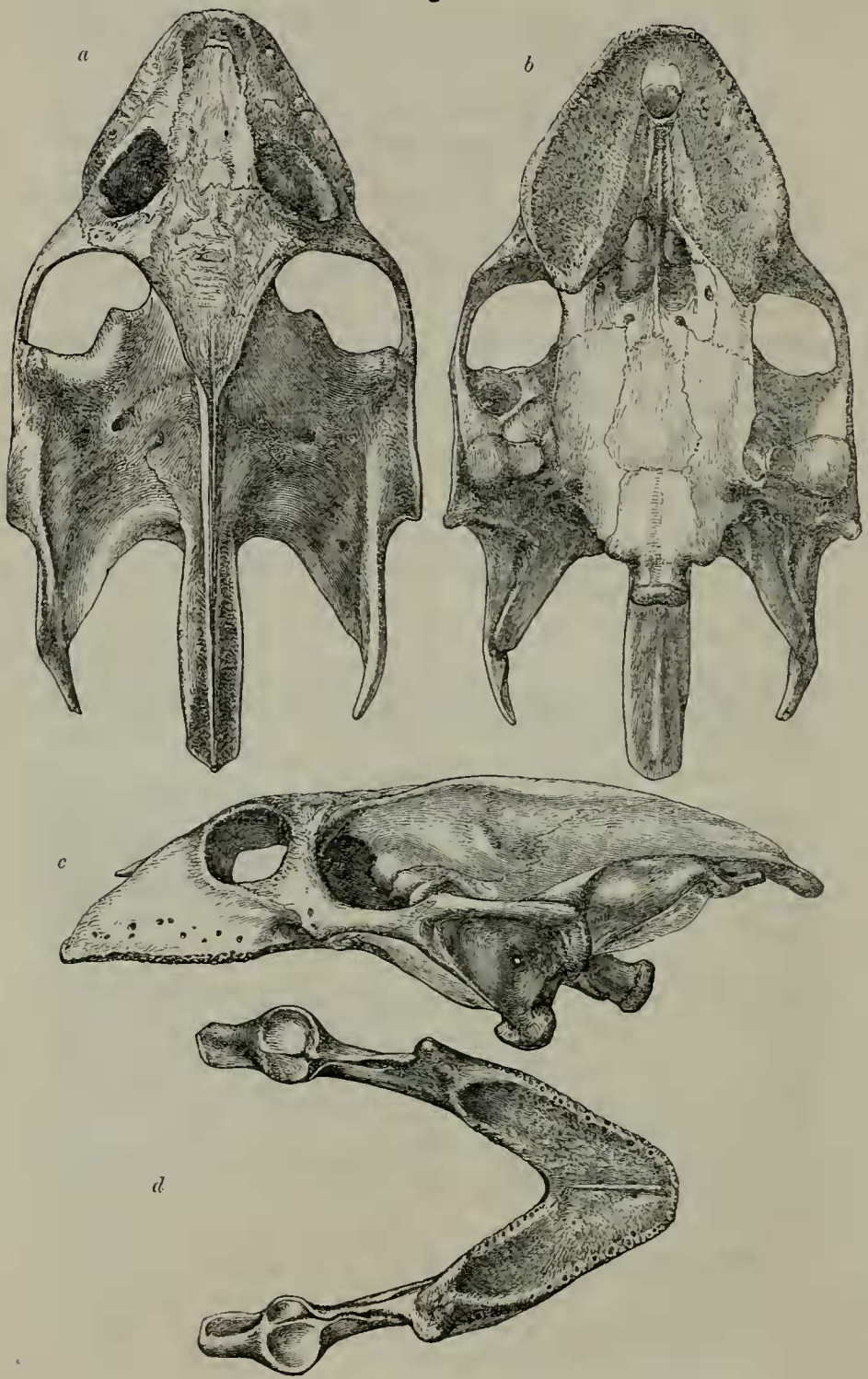
The skull is nearly as large as the skull of the *Baikiea* received from Western Africa, but is immediately known from it by being more conical in front.

1. Fordia africana, Gray, P. Z. S. 1869, p. 119; Suppl. Cat. Sh. Rept. p. 100. (Fig. 1, p. 44.)

Tyrse nilotica, var., Gray, P. Z. S. 1864, p. 88.

Hab. Upper Nile (Chartum).

Fig. 1.



Fordia africana.

2. Nilssonia.

Skull elongate, tapering on the sides in front, the forehead suddenly bent down; the nose of the skull between the orbit and the oblong four-sided erect nose-hole not more than half the diameter of the orbits. The front of the palate concave, with a narrow deep groove to the septum, between the internal nostrils, which is rather wider in front, and then about the same width behind, where it is very deep; alveolar surface very wide, gradually tapering off towards the front of the mouth; lower jaw very strong; alveolar surface much wider in front than at the sides, with a deep, short, longitudinal pit in the front half of the front edge, which is rather concave. Hinder part narrower, concave, with a strong prominence on the inner edge.

Nilssonia, Gray, Ann. & Mag. N. Hist. 1872, x. p. 332.

The skull from which this genus is described was received in 1865, probably from India; but I have not been able to find any Indian Mud-tortoise with which it could be identified.

The skull is three inches long from the end of the nose to the posterior condyle, and an inch longer to the end of the central longitudinal ridge, and is two inches wide just in front of the tympanic aperture, which is the widest part of the skull.

1. Nilssonia formosa. (Fig. 2, p. 46.)

Only young animal known. Back olive, with four large spots, with a black eye and a narrow white edge. Head with a spot behind each eye and at the angle of the mouth, and a large white transverse band on each side of the back of the head, interrupted in the middle of the upper part.

Skull shorter and broader than that of the adult.

Trionyx formosus, Gray, P.Z.S. 1869, p. 217, t. 15. fig. 1 (young); Suppl. Cat. Sh. Rept. p. 99.

Hab. India (Pegu, Theobald's coll.). B. M.

It appears that this and the other *Trionyx* marked "Pegu" do not really come from that place; for although the collection was sold as from "Pegu," it contained many specimens from other parts of Hindostan.

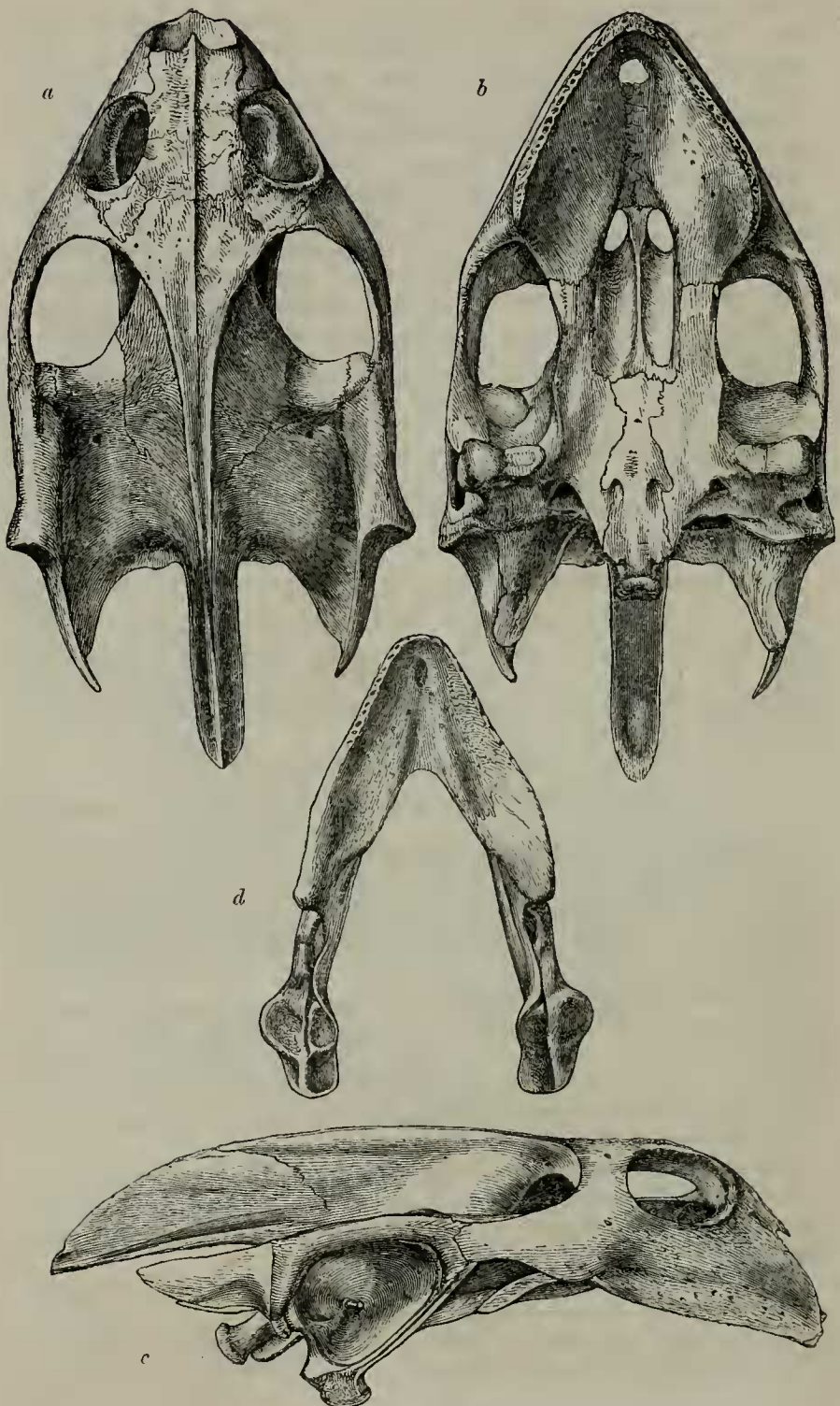
The skull of the very young animal described as *Trionyx formosus* (only ¾ inch long) in the British Museum, which has as yet no dorsal or ventral callosities, is very like the adult skull above described, but is shorter and broader, and the groove in front of the internal nostrils is deeper. I think that this is probably the effect of age, and that the skull becomes longer by growth.

I have named this genus after my old friend Dr. Sven Nilsson, of Lund, who has been working on zoology since 1816, and more lately on archæology, and is now, in his 86th year, in the full vigour of his intellect.

Two young specimens in spirits have no sternal callosities; but all the bones of the sternum are seen through the skin.

The back of the young is marbled, and has the four eyed spots like the young of the genus *Trionyx*.

Fig. 2.



Nilssonia formosa.

3. Trionyx.

Trionyx, Gray, P. Z. S. 1864; Suppl. Cat. Sh. Rept. p. 88, fig. 32.

Palate of the skull with a broad shallow concavity to the internal nostrils, of the same width before and benind.

The alveolar surface of the lower jaw is usually more or less concave, and often marked with a central longitudinal ridge over the suture of the jaw.

The form of the alveolar surface, and the comparative width of various parts of it, and the various concavities and ridges on the different parts of its surface afford excellent characters for the species.

The dorsal disk in the young animals is generally marked with three pairs of black spots, which have concentric pale rings within. These spots often last, in a more or less perfect degree, through the life of the animal. Sometimes the anterior, and sometimes the posterior pair, and rarely a spot on one side of these pairs, are deficient. The crown of the head of the young specimens is generally marked with spots of various colours, which become more and more indistinct as the animal grows. I believe that these spots are characteristic of the species; and sometimes whole series of species have characteristic spots—that is to say, on the side of the crown and face.

The skulls of the species of this genus which we have in the British Museum may be divided into two sections:—

1. *Nose of skull broad, rounded in front.* Trionyx gangeticus.
2. *Nose of skull tapering, converging in front.* T. sewaare, T. jeudii, T. leithii.

* *Crown of head olive, with radiating black lines behind.*

1. Trionyx gangeticus. The "Dekoolee." (Plate VIII.)

Skull short, broad; nose suddenly bent down, with a rounded outline. Eyes within a very short distance of the cavity of the nostrils, which is not as long as the diameter of the orbit; alveolar surface of the lower jaw deeply concave, with a very slight indistinct central longitudinal ridge.

The Dekoolee, Hardwicke, icon. ined.

Trionyx du Ganges, Cuvier, Oss. Foss. v. pt. 2. p. 187, tab. ii. figs. 5–8 (skull).

Trionyx gangeticus, "Duvaucel," Cuvier, Règne Animal, vol. ii. p. 16; Gray, Cat. Sh. Rept. B. M. p. 66, tab. 42. fig. 1; Suppl. p. 97, fig. (skull only).

Gymnopus duvaucelii, Duméril and Bibr. Erpét. Générale, vol. ii. p. 47.

Aspidonectes gangeticus, Wagler, Amphib. Taf. ii. figs. 13–22; copied from Cuvier.

Trionyx javanicus, Gray, Cat. Sh. Rept. p. 67 (not synonyma).

Potamochelys stellata, Gray, Suppl. Cat. Sh. Rept. B. M. p. 104 (animal only, not skull).

Variety? The black lines irregular.

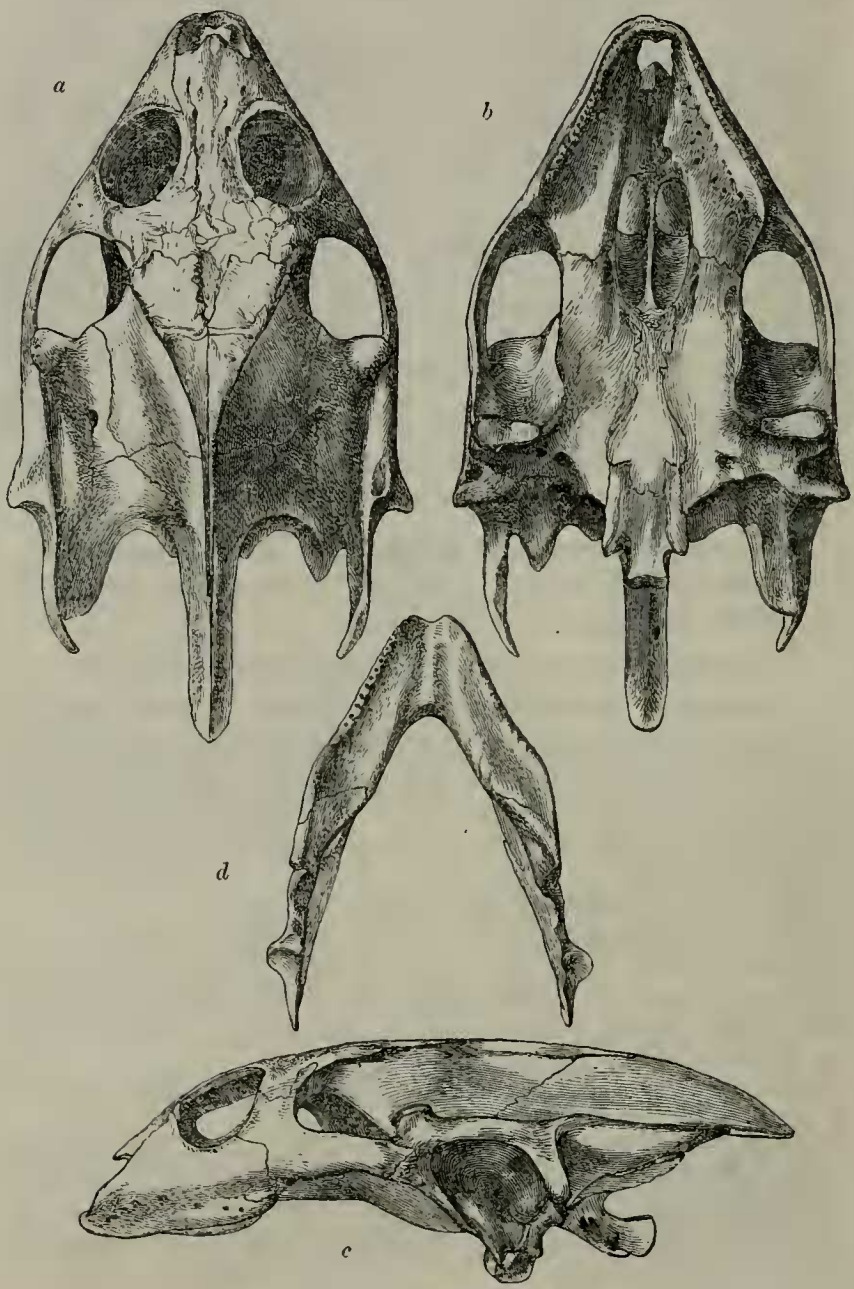
Jaank, Hardwicke, icon. ined.

Inhabits India.

See history of the species and skull, Ann. & Mag. N. H. 1872, x. p. 334.

In a young specimen, with the sternal callosities partly developed,

Fig. 3.



Trionyx leithii.

the front odd bone of the dorsal disk is quite separate, with a transverse oblong pitted callosity; the front margin of the dorsal disk has a central prominence nearly reaching the back edge of the odd bone.

In young specimens the odd bone in the front of the dorsal disk is transversely elongate, rugose the whole of its width, separate from but very close to a central prominence in front of the dorsal disk.

2. Trionyx leithii. The Poonah Mud-tortoise. (Fig. 3, p. 48.)

A small species, the shell about 10 inches long and $6\frac{1}{2}$ broad; the alveolar surface of the lower jaw nearly flat, with a very slight longitudinal ridge across the front end.

Trionyx leithii, Gray, Ann. & Mag. N. H. 1872, x. p. 334.

Hab. Poonah, *Dr. Leith.*

The history of this species is given in the Ann. & Mag. N. H. 1872, x. p. 334.

There are two other specimens in the British Museum, from Mr. Day. The older one has the dorsal disk suborbicular, concavely truncated behind. The odd bone in front about half the width of the widest part of the dorsal disk, and united to it.

The younger one has the dorsal disk with numerous, close, rather irregular, minute tubercles; the hinder edge is regularly arched; the front edge truncate, with a deep arched notch on each side of the central prominence; the odd marginal bone is rather broad, arched in front, and slightly concave on the sides of the inner edge, about $\frac{1}{4}$ as wide as the breadth of the broadest part of the disk.

** *The hinder part of the crown and sides of the head marked with pale spots.*

3. Trionyx hurum. The "Kaavez."

Crown of the head varied with irregular black lines; a yellow spot on each side of the crown and at the back angle of the mouth.

Kaavez, Hardwicke, icon. ined. B. M.

Trionyx hurum, Gray, Synopsis Rept. tab. 10, copy of Hardwicke; Gray, Ill. Ind. Zool. tab., copy of Hamilton's; Gray, Ann. & Mag. N. Hist. 1872, x. p. 335.

Testudo hurum, Hamilton, icon. ined.

The history of this large species is to be found in the Ann. & Mag. N. Hist. 1872, x. p. 336.

4. Trionyx jeudii.

Skull, with nose rather elongate, produced forward, with a rather tapering outline; orbit further from the cavity of the nostrils than the diameter of the orbit; alveolar surface of the lower jaw with a very distinct central longitudinal ridge in front, with a deep pit on each side.

Trionyx jeudii, Gray, P. Z. S. 1869, p. 217, fig. 19; Suppl. Cat. Sh. Rept. p. 97, fig. 32 (skull).

Hab. India.

The skull only is known, which probably belongs to *Trionyx hurum*, as it seems to come from a large species not uncommon in India, as is the case with *T. hurum*.

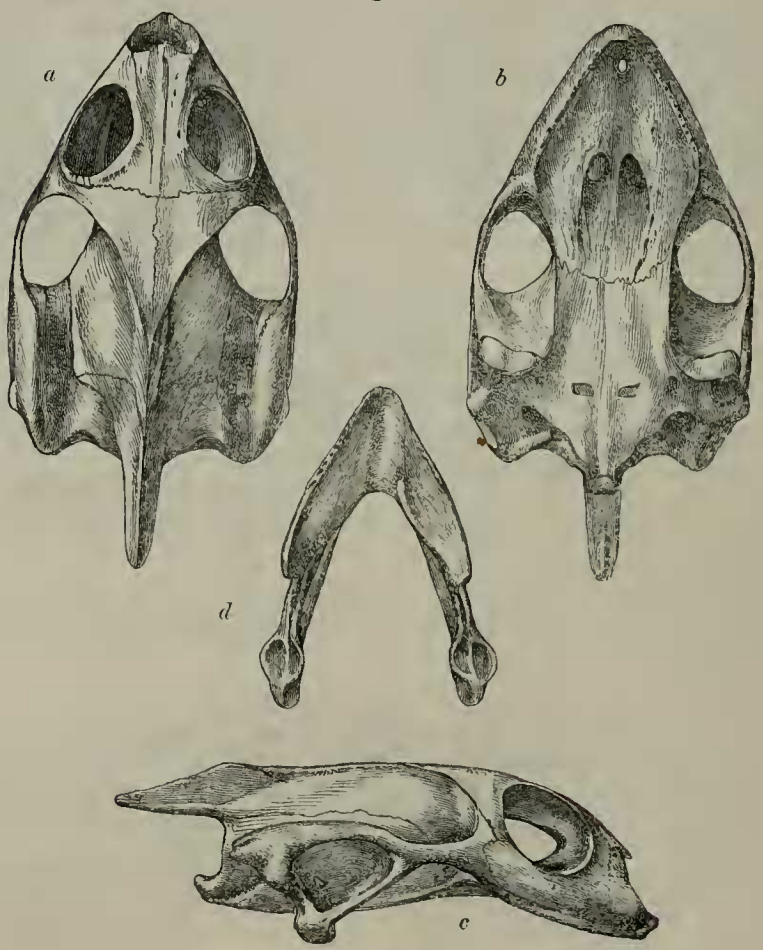
There is a second specimen of this skull, which was given to the British Museum by Mr. Theobald as the skull of his *Trionyx phayrei*. It certainly was not the skull of the species which he described under that name in the 'Journal of the Linnean Society,' and not that of the tortoise described under that name by Dr. Anderson.

5. Trionyx sewaare. (Fig. 4.)

The upper surface of the head uniform olive, with a distinct yellow spot on each side of the crown.

Sewaare, Hardwicke's icon. ined. in B. M.
Trionyx gangeticus, var., Gray, Suppl. Cat. Sh. Rept. p. 97.
Trionyx sewaare, Gray, Ann. & Mag. N. Hist. 1872, x. p. 336.
Hab. Bengal.

Fig. 4.



Trionyx sewaare.

The skull of a young species, tapering in front, the palatine groove rather wide, narrower behind. The lower jaw very broad in front, with a broad central longitudinal groove, nearly reaching the front edge, and a wide longitudinal groove on the inner part of the sides, with a narrow well-raised edge on the inner side.

The history of this species, and the account of the specimens in the Museum, is given in my paper on Indian Mud-tortoises in the Ann. & Mag. N. Hist. 1872, x. p. 336.

6. Trionyx ocellatus.

Only known young; callosities not developed; nose before the eyes with a broad lunate yellow spot.

Testudo ocellatus, B. Hamilton, icon. ined.

Trionyx ocellatus, Gray, Ill. Ind. Zool. (copy of Hamilton); Gray, Ann. & Mag. N. Hist. 1872, p. 337.

Gymnopus ocellatus, Duméril & Bibr., Erpét. Gén. iv. p. 9?

Hab. India. B.M.

For the history of this species I refer to my paper in the Ann. & Mag. N. Hist. 1872, x. p. 337.

7. Trionyx bellii.

Only known from young; callosities not developed; upper part of the head black, white-spotted on the crown, with a red spot on the side of the temple and on the angle of the mouth.

"*Trionyx gangeticus*, Cuvier," Bell's MS.; Gray, 'Tortoises, Terrapins, and Turtles,' p. 11, tab. 51.

Trionyx bellii, Gray, Ann. & Mag. N. Hist. 1872, x. p. 337.

Hab. Asia.

Only known from Mr. Bell's figure. See observation on it and on *Trionyx stellatus japonicus* in the Ann. & Mag. N. Hist. 1872, x. p. 337.

4. Isola.

Palate of the skull with a broad shallow concavity to the internal nostrils, which is rather wider behind.

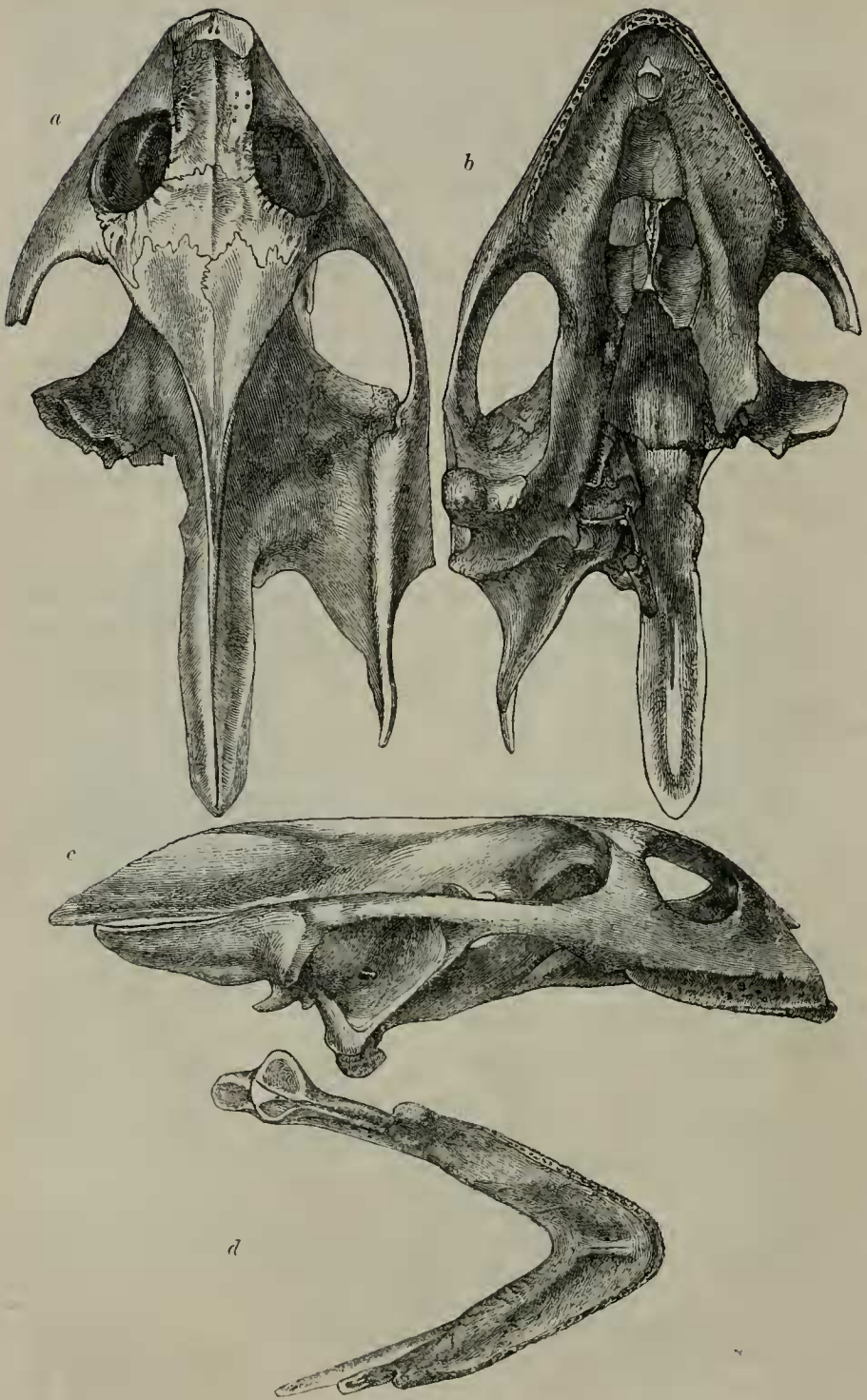
The skull of the head obtained from Mr. Theobald is rather elongate (4 inches long); the nose rather tapers on the side, and is rounded in front; nose at the eyes about two thirds the width of the orbit; the groove in front of the palate rather wide, shallow in front, gradually *wider* and deeper behind; the upper edge of the lower jaw flat behind, rather wider in front, and more concave, with a deep oblong impression on each side of the well-marked keel, which occupies more than half of the middle of the front end.

This skull is peculiar for the central palatine groove before the nostrils not being so wide as in *Trionyx*, and in being rather wider and much deeper before than behind.

1. Isola peguensis. (Fig. 5, p. 52.) B.M.

Head pale olive above, minutely and closely punctate with black. Lips and beneath whitish.

Fig. 5.



Isola peguensis.

Trionyx? peguensis, Gray, Suppl. Cat. Sh. Rept. p. 99; Ann. & Mag. Nat. Hist. 1872, x. p. 337.

Hab. India (Pegu, Theobald's coll.).

5. Landemania.

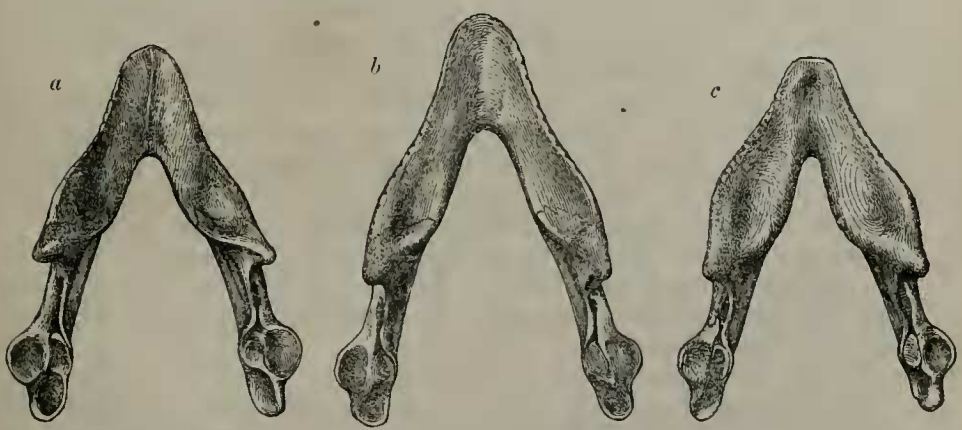
Landemania, Gray, P. Z. S. 1869, p. 212; Suppl. Cat. Sh. Rept. p. 96.

Skull tapering in front; nose short; space between the square nose-hole and the orbit about half the diameter of the latter; the palate with a rather elongated, somewhat broad, deep concavity from the front to the internal nostrils, which are nearly on a line with the front end of the zygomatic cavity; alveolar surface gradually becoming wider and broader on the hinder part of the sides. Lower jaw much produced in front, contracted on the sides, with a deep concavity on the upper surface, which is very long. Hinder part of the sides with a deep concavity; edge with a convexity on the inner side, and a deep ridge on the outer side.

Length of skull $2\frac{1}{4}$ inches; width $1\frac{3}{8}$ inch.

The skulls from different specimens from China vary considerably. The nose in some is longer than in others; they show a gradual passage in this respect. The length of the under jaw shows a similar variation. In two of the specimens the front of the alveolar surface, which is deeply concave, is smooth; but in the other, which was from the half-dried specimen of *Landemania irrorata*, there is a slight indication of a central longitudinal keel. The hinder part of the alveolar surface on the side is not quite so concave; but I see no other appreciable difference. (See fig. 6.)

Fig. 6.



Landemania perocellata.

The genus *Landemania* was first described from a specimen that had been dried before it was placed in spirit; and the rugosity on the surface is very slight, if not produced by accident. At any rate, I think it wants confirmation. I believe, after comparing its skull with the skull of *Trionyx perocellatus*, also from China, that it is

identical with that species. The skin shows the white spots on the underside of the head.

1. LANDEMANIA PEROCELLATA. (Fig. 6, p. 53.)

Head olive above, with a black streak from the back edge of the eye, extending along the upper part of the sides of the neck.

Trionyx perocellatus, Gray, Cat. Tort. B. M. p. 48; Cat. Sh. Rept. p. 65, t. 31 (animal in spirit).

Potamochelys? perocellata, Gray, P. Z. S. 1864, p. 86.

Landemania? perocellata, Gray, P. Z. S. 1869, p. 216; Suppl. Cat. Sh. Rept. p. 96; Ann. & Mag. Nat. Hist. 1872, x. p. 338.

Landemania irrorata, Gray, P. Z. S. 1869, p. 218, fig. 18; Suppl. Cat. Sh. Rept. p. 96, fig. 31 (sternum, from dried specimen).

Trionyx tuberculatus, Cantor's drawings, Gray, P. Z. S. 1861.

Potamochelys tuberculatus, Gray, P. Z. S. 1864, p. 87; Suppl. Cat. Sh. Rept. p. 105.

Hab. China (Chusan).

The specimen figured in the Cat. Sh. Rept. has the head olive, with a few irregular black spots, with a long narrow streak from the back edge of the eye, and two or three streaks from the lower edge of the eye towards the lips; front extending towards the nostrils; lips and throat with large white spots; dorsal disk smooth (in spirit), the odd bone united to the rest of the disk; four sternal callosities distinctly marked, but the front odd bone is smooth.

The dorsal disk convex, with a longitudinal depression on each side of the central linear prominence; the odd bone large, transverse, united to the whole length of the dorsal disk.

There is a specimen in the British Museum with the sternal callosities not so much developed; and the odd bone in front of the sternum, which is V-shaped, has short arms, not so long as the breadth of the triangle. It is smooth, and not marked with callosities; but otherwise the two specimens are exceedingly alike.

The skull of the specimen described as *Landemania irrorata* is tapering in front; between the transverse nose-hole and the orbit about half the length of the diameter of the orbit; palate with a broad shallow impression between the front and the nostrils, which becomes narrower behind; alveolar surface broad, especially behind. Lower jaw produced in front, triangular, sides rather concave; alveolar surface concave, broad in front, with a slightly elevated central longitudinal ridge, rather narrower on the sides behind, and deeply concave, with a strong ridge on the outer side.

Length from nose to condyle $2\frac{1}{8}$ inches.

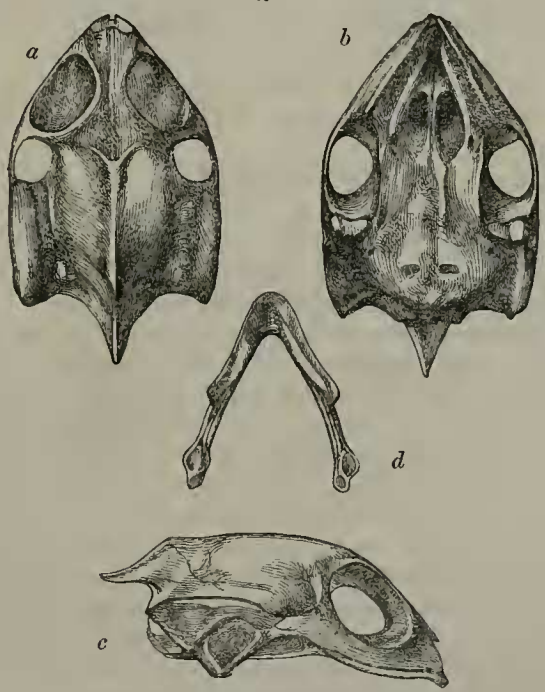
A skeleton of a specimen received from Mr. Swinhoe. The front bone of the dorsal shield very wide, nearly as wide as the second bone, united through its whole length to the second bone; front pair of bones to the sternum subcylindrical; the pair of lateral bones on the sternum united together by a minutely dentate suture.

Dr. Cantor's drawing, which I had described as *Trionyx tuberculatus* and *Potamochelys tuberculata* in the Cat. Sh. Rept. p. 105, is most probably only a variety of this species.

6. Ida.

Animal only known in the young state, not exhibiting the dorsal bones. Sternal callosities not developed, but apparently like *Landemania*. Skull short, broad; nose very short, contracted in front, not one third the length of the large orbits, which are only separated by a very narrow forehead; palate with a rather broad and deep groove before the internal nostrils; alveolar process broad. The lower jaw slender, tapering, regularly rounded in front; alveolar surface broad and concave in front, with a sharp raised outer edge; sides narrow, concave on the inner side of the alveolar surface, with a raised inner and outer edge. This genus is at once known from *Landemania* and *Dogania* by its shorter and more rounded nose, and by the much weaker lower jaw, and especially from the latter genus by the lower jaw not being narrowed on the front of the outer edge.

Fig. 7.



Ida ornata.

1. Ida ornata. (Fig. 7.)

Young only known.

Back pale brown, with large irregularly disposed solid black spots, those on the dorsal keel and on the front of the sides largest; the head darker, with white spots of irregular size and form on the chin and lower side of the neck; legs dark, with small white spots on the front of the narrow edge.

Trionyx ornatus, Gray, P. Z. S. 1861, p. 41, t. 5 (young); Ann. & Mag. Nat. Hist. 1860, vi. p. 208, 1861, vii. p. 422.

Aspilus? *ornatus*, Gray, P. Z. S. 1864, p. 85; Suppl. Cat. Sh. Rept. p. 103 (part).

Hab. Camboja (*Mouhot*). Two specimens in the British Museum.

The specimens are without distinct sternal callosities; but the V-shaped front bone, the large triangular anal bones, and the lateral bones are seen through the skin, apparently indicating four sternal callosities, and probably the roughness of the surface of the V-bone, which is found in the species of *Landemania*; but it is very desirable to obtain adult specimens.

The skull of the young specimen is short and broad, with the nose shelving down rapidly in front; the orbits are very large, more than three times the length of the nose in diameter; the space between the eyes is very narrow; the palate has a rather broad and deep groove in front, rather wider behind; alveolar process broad. Lower jaw moderate, concave in front, with a sharp edge before and on the sides; sides much narrower, slightly concave behind, with a raised edge on the inner side.

7. Dogania.

Dogania, Gray, P. Z. S. 1864, p. 82; Suppl. Cat. Sh. Rept. p. 106, fig. 36 (skull).

Sarbieria, Gray, P. Z. S. 1869, pp. 212–220; Suppl. Cat. Sh. Rept. p. 109 (adult).

Skull tapering in front. Nose very short; space between the square nose-hole and the orbit less than half the diameter of the latter; internal nostril opening halfway between the front, and in a line with the front of the zygomatic cavity; palate short, the space between the front and the front end of inner nostrils broad, concave, rather deep, and scarcely narrower behind. Lower jaw with a moderately broad alveolar surface, the front end deeply concave, leaving a sharp edge; the hinder part flattened, very slightly concave, narrow in front, and gradually wider behind. Length to condyle $2\frac{1}{8}$ inches; breadth at ears $1\frac{1}{2}$ inch. (Fig. 8, p. 57.)

When describing the genus *Sarbieria*, I observed that it was in many respects allied to *Dogania*, but it appeared to have four callosities. "The upper surface of the beak is concave, narrow in front, and wider behind; but it is difficult to compare a head with the beak on with a prepared skull without a beak." When the skull was extracted it was found to be exactly like *Dogania*.

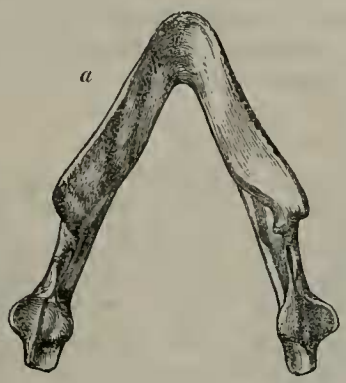
It is remarkable that of this Tortoise, which is sold in the markets, and is much esteemed for its flesh in Singapore, I have never seen, and do not believe that there is in Europe, an adult specimen.

Probably in this species the callosity and pits are developed later than is usual in the other kinds of the family.

The young specimens in the Museum have the odd or single bone of the back quite separate from the dilated ribs, as in the other young Mud-tortoises; and the surface is without any rugosity, or only shows obscure indications that it may become callous and pitted. In the specimen described as *Dogania güntheri*, which may be a small spe-

cies of the genus or an undergrown state of the animal, the upper surface of the odd bone is rather callous for a great part of its length, and with a few pits on its hinder margin; therefore I strongly suspect that, in the adult specimens, the bone is united to the ribs with a callous and pitted surface, as in the *Trionychina*.

Fig. 8.



Dogania subplana.

1. DOGANIA SUBPLANA. (Fig. 8.)

Head pale-spotted, with a dark streak from the side of the nose to the orbit.

Trionyx subplanus, Geoff. Ann. Mus. iv. p. 11, t. 3. fig. 2; Gray, Illustr. Ind. Zool. t., from Hardwicke's drawing (young).

Dogania subplana, Gray, Cat. Tort. B. M. p. 49, 1844; Ann. & Mag. N. H. xii. 1863, p. 158; Cat. Sh. Rept. p. 69, t. 33, in spirit; P. Z. S. 1862, p. 265, 1864, p. 83, figs. 1, 2, 3 (skull), 1869, p. 213; Suppl. Cat. Sh. Rept. p. 106, fig. 35 (skull).

Trionyx frenatus, Gray, Cat. Sh. Rept. p. 67 (part).

Potamochelys? frenatus, Gray, P. Z. S. 1864, p. 87.

Sarbieria frenata, Gray, P. Z. S. 1869, pp. 212–220; Suppl. Cat. Sh. Rept. p. 100.

Hab. China and Formosa (*Swinhoe*); Singapore? (*Wallace*); not the Ganges, as erroneously stated by Duméril and Bibron.

Gen. Hardwicke's specimen, figured in his drawing, which is copied in the 'Illustrations of Indian Zoology,' is in the Museum. The front lateral bone of the sternum has indications of rugosity on the inner part of the hinder edge; but this rugosity is of an irregular shape, not like the linear lateral callosities of *Aspilus*. All the other sternal bones are smooth; but the animal is evidently immature, just noticed as a variety of *Trionyx frenatus*. The sternum of the specimen described in Cat. Sh. Rept. as *Sarbieria frenata*, brought from Singapore by Mr. Wallace, is about half the size of the former. The front and hinder lateral bones are marked with a number of dots and inosculating lines, as if they were to have, when they become older, callosities covering the greater part of the central lateral portion, very unlike the linear callosities of *Aspilus*.

The hinder bones have some very indistinct inosculating lines on their surface, which I thought indicated that in a more perfect state they would have distinct callosities; and I am by no means sure that this may not be the character of the genus; and I think it very probable that the animal figured as *Trionyx subplanus*, which is the type of the genus *Dogania*, and *Sarbieria frenata* are the same species.

The chief difference between the two specimens is that the larger one has the back edge of the odd bone slightly rugose, forming an indistinct lunate cross band, whereas the surface of this bone in the smaller specimen is quite smooth.

2. Dogania guentheri.

Dogania güntheri, Gray, P. Z. S. 1862, p. 264.
Trionyx güntheri, Günther, Rept. Brit. Ind. i. p. 49, t. 6. fig. 4.

The odd bone in front of the dorsal disk not quite so distinctly separated as in the other species; the greater part of its upper surface pitted and callous; a broad semiovate notch in the hinder margin. Inner part of the hinder edge of the lateral sternal bones rather rugose; and this is the case with the whole inner portion of the hinder lateral bone.

The whole surface of the hinder pair of bones is more or less rugose, indicating, I think, that the inner part of the lateral bones, and greater part of the hinder bones, are punctate and callous in the adult, as in *Trionyx*.

The animal from which this species is described has been dried without preparation.

8. Platypeltis.

Platypeltis, Gray, P. Z. S. 1869, p. 214; Suppl. Cat. Sh. Rept. p. 107.

Skull [imperfect behind]; face tapering, rounded in front; nose-hole large, rather longer than broad, with the nasals acute and projecting above in front; space between the nose-hole and the orbits less than half the diameter of the orbit. Alveolar surface of the upper jaw moderate, gradually wider, and then of equal width its whole length, with a raised inner margin. Groove in the centre of the palate broad, rather deep, gradually broader behind, as wide as the front of the large inner nostril, and continued on the sides. Lower jaw strong; alveolar surface concave, with a sharp outer edge, broad and most concave in front, narrow and of nearly the same width to the base of the ascending rami.

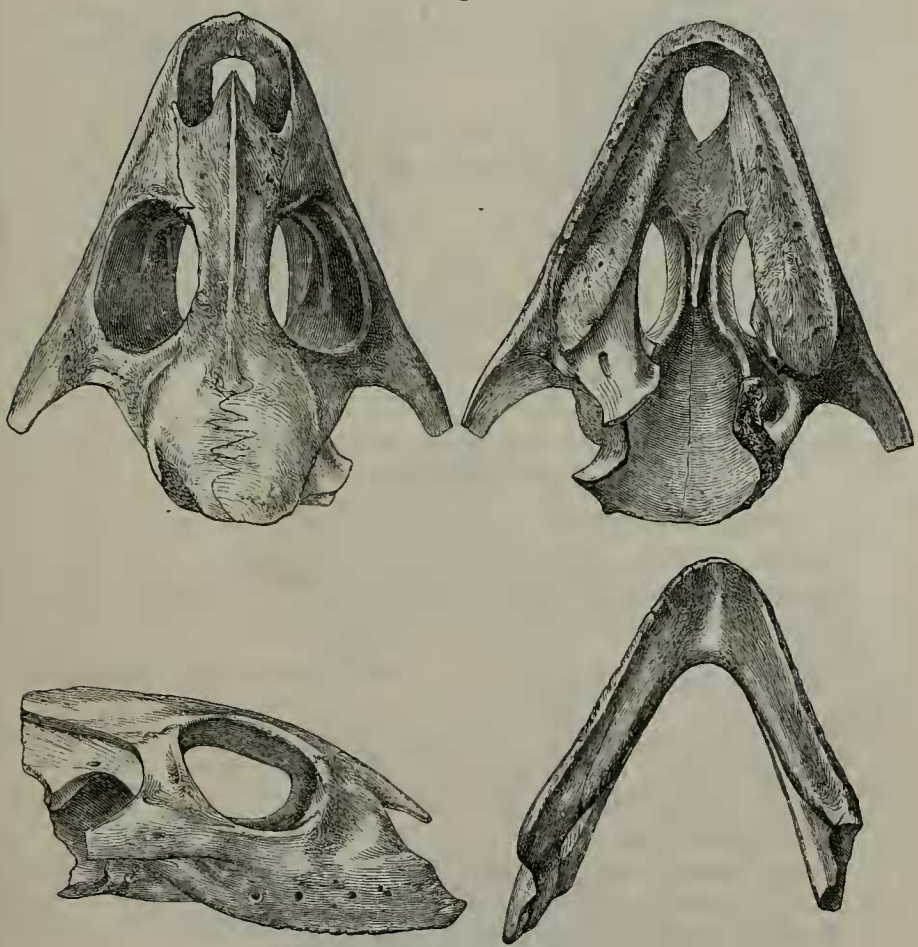
1. Platypeltis ferox. (Fig. 9, p. 59.)

Upper part of the head brown, with a black streak from the base of the nose to the back of the eye, and continued from the lower part of the back of the eye. Back of the dorsal disk with a longitudinal series of small spines.

Testudo ferox, Pennant, Phil. Trans. xli. p. 266, t. 10. fig. 5 (copied in Shaw's Zool. iii. p. 64, t. 17. fig. 1); Gray, Cat. Sh. Rept. p. 68.

Trionyx georgicus, Geoffr. Ann. Mus. iv. p. 7 (from Pennant).
Trionyx ferox, Leconte, Ann. Lyc. N. York, 1830, iii. p. 393.
La Molle, Lacépède, Qu. Ov. et Serp. i. p. 137, t. 7 (from Pennant).
Gymnopus spiniferus (part), Duméril et Bibr. Erpét. Gén. ii. p. 477.
Aspidonectes ferox, Wagl. Syst. t. 2. figs. 34 & 35.
Platypeltis ferox, Fitz. Rept. p. 30; Gray, P. Z. S. 1869, p. 214; Suppl. Cat. Sh. Rept. p. 107; Agassiz, Contrib. t. 6, fig. 3 (young).
Trionyx frenatus, a, Gray, Cat. Sh. Rept. p. 67 (young).
Gymnopus javanicus, Bibr. MSS. Mus. Zool. Soc.

Fig. 9.



Platypeltis ferox.

The skull of a young specimen received from the Zoological Society has the head depressed; nose tapering in front; nose-hole large, wider behind, with the upper edge prominent in the middle; distance between the nose-hole and the orbit $\frac{1}{3}$ the diameter of the latter; orbits large, close together; alveolar surface narrow in front,

gradually wider behind ; central groove wide, rather deep, as wide as the front edge of the large internal nostrils. Lower jaw rather weak ; alveolar surface with a sharp edge, shelving inwardly ; front part widest, concave ; sides rather narrower, with a concave upper edge, gradually becoming narrower behind to the condyle. Length of the skull to condyle $1\frac{1}{8}$ inch ; diameter $\frac{3}{4}$ inch.

This specimen was named *Gymnopus javanicus* by Bibron, and was described by me as *Trionyx frenatus* in the Cat. Sh. Rept. p. 67, where I thought it was the same as a Tortoise I had received from Mr. Wallace, from Singapore : but the examination of the skulls has shown that the former is the young of the North-American *Platypeltis ferox* ; and the latter proves to be merely a specimen of *Dogania subplana* approaching maturity, which I had named *Sarbieria frenata*, an Asiatic species—showing the necessity of examining the jaws and skulls of these animals.

9. Callinia.

Callinia, Gray, P. Z. S. 1869, p. 221 ; Suppl. Cat. Sh. Rept. p. 108.

Head elongate, rather thin, produced in front ; nose-hole large, nasal bones projecting into its upper surface, acute ; orbits large ; palate with a wide shallow central depression, as wide as the large internal nostrils, and continued along its sides. Lower jaw weak, thin ; alveolar margin concave, much wider in front, narrower on the sides, especially behind.

* *The skull rather rounded in front ; nose-hole as broad as long ; lower jaw rounded in front.*

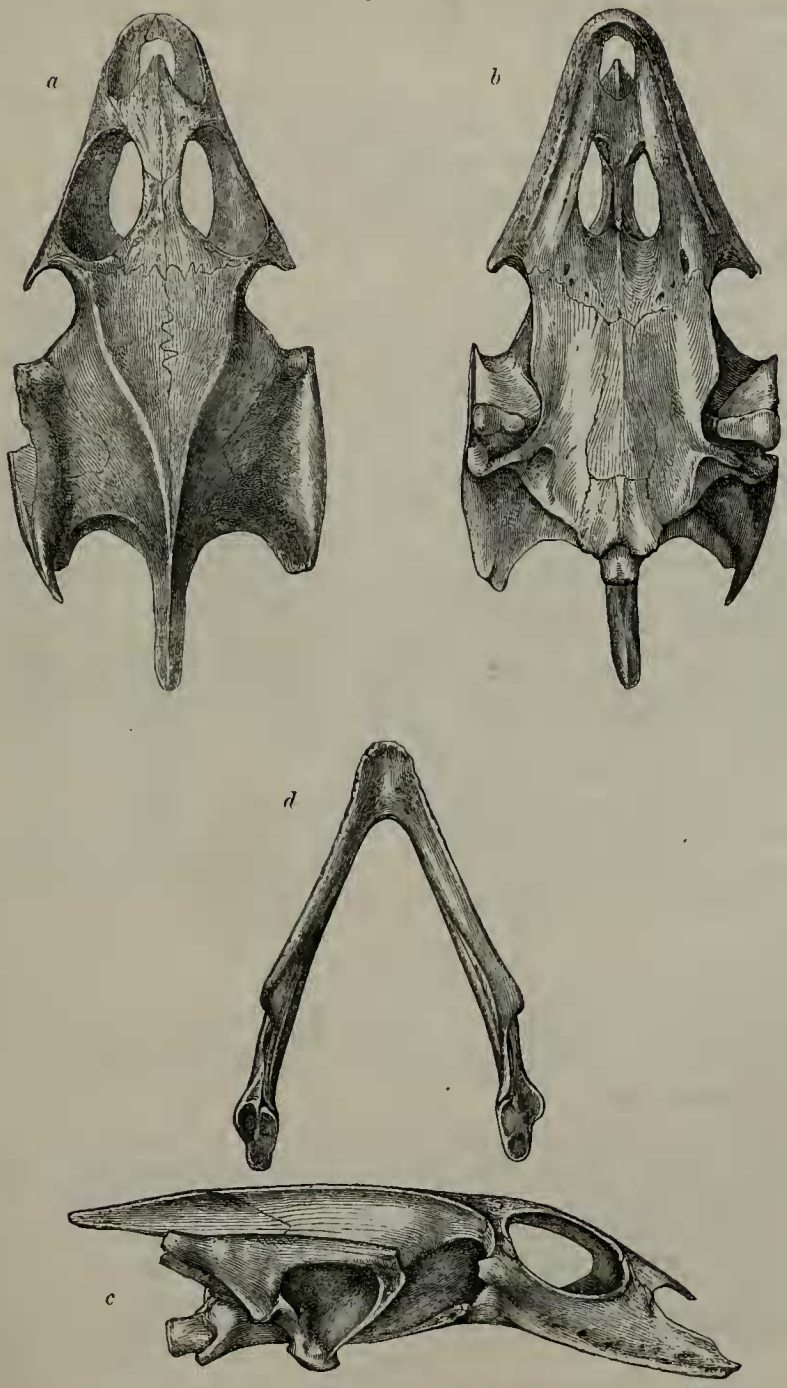
1. Callinia spinifera. (Fig. 10, p. 61.)

Trionyx spiniferus, Lesueur, Mém. Mus. xv. p. 258, t. 15.
Aspidonectes spinifera, Agassiz, Contrib. p. 403, t. 6. figs. 1 & 2.
Gymnopus spiniferus (part), Dum. et Bibr. Erpét. Gén. ii. p. 477, t. 22. fig. 1.
Callinia spinifera, Gray, P. Z. S. 1869, p. 220 ; Suppl. Cat. Sh. Rept. p. 109.
Trionyx ferox (part), Gray, Cat. Sh. Rept. p. 63.
Trionyx ferox, e, Holbrook, Herpet. N. Amer. ii. t. 1.
Trionyx argus, Gray, Cat. Sh. Rept. p. 68.
Tyrse argus, Gray, Knowlesley Menag. t.

Young.—Back with dark rings.
Trionyx ocellatus, Lesueur ; Wied, Voy. Amér. Sept. iii. p. 244.
Trionyx annulatus, Wied, Voy. Amér. Sept. iii. p. 242.
Hab. North America.

Skull elongate, produced in front, rounded at the end ; nose-hole large, as broad as long, with the nasal bones projecting into the upper surface, acute ; orbits very large ; palate with a wide, rather shallow, central depression, as wide as the front of the large nostrils, and continued round the sides of the nostrils, and rather wider than they behind. Lower jaw rather weak, regularly tapering in front, where it is rounded ;

Fig. 10.



Callinia spinifera, enlarged.

alveolar margin concave, much wider in front, narrower on the sides, and becoming narrower at the end. Length to condyle 1½ inch; breadth at ears ⅞ inch.

** *Skull very slender in front; nose-hole longer than broad; lower jaw contracted in the front of the side margin.*

2. Callinia microcephala. (Fig. 11, p. 63.)

Potamochelys? microcephala, Gray, P. Z. S. 1864, p. 87.

Callinia microcephala, Gray, P. Z. S. 1869, p. 220; Suppl. Cat. Sh. Rept. p. 108.

Hab. Borneo, Sarawak.

Skull slender, rather thin; nose much attenuated and acute in front, not quite as long as the diameter of the orbit; nose-hole very large, with the nasal bones acute and projecting into the upper surface; space between the side of the nose-hole and the orbit very small, not a quarter the size of the diameter of the large orbit; forehead lozenge-shaped, elongate; palatine surface nearly flat, with a wide, rather shallow groove, which is as wide as the front of the large internal nostrils, and continued as a line along their outer sides. Lower jaw very slight and slender, rather produced in front, where the rami are united, about one third the length of the front part of the jaw to the condyle; alveolar surface narrow, acute in front, which is concave internally and on the sides, where the jaws are compressed. Length of skull 1½ inch; breadth ¾ inch.

The skull is something like *Tyrse*; but the nose is shorter, nose-hole much larger and extending up the sides of the face; anterior central groove not so large behind.

The skull is very like *Callinia spinifera*, but is much more slender, and more sharp and attenuated in front; and the lower jaw is also much more attenuated and rather contracted on the front of the sides; the nose-hole is narrower and more elongate.

10. Amyda.

Amyda, Gray, Suppl. Cat. Sh. Rept. p. 95.

This is one of the few Mud-tortoises that I have not seen. Agassiz says, "The lower jaw is sharp-edged all round."

1. Amyda mutica.

Trionyx muticus, Lesueur, Mém. Mus. xv. p. 237, fig. 7; Holbrook, Herp. N. Amer. ii. p. 19, t. 2; Gray, Syn. Rept. p. 46; Cat. Sh. Rept. p. 69.

Gymnopus muticus, Dum. et Bibr. Erpét. Gén. ii. p. 482.

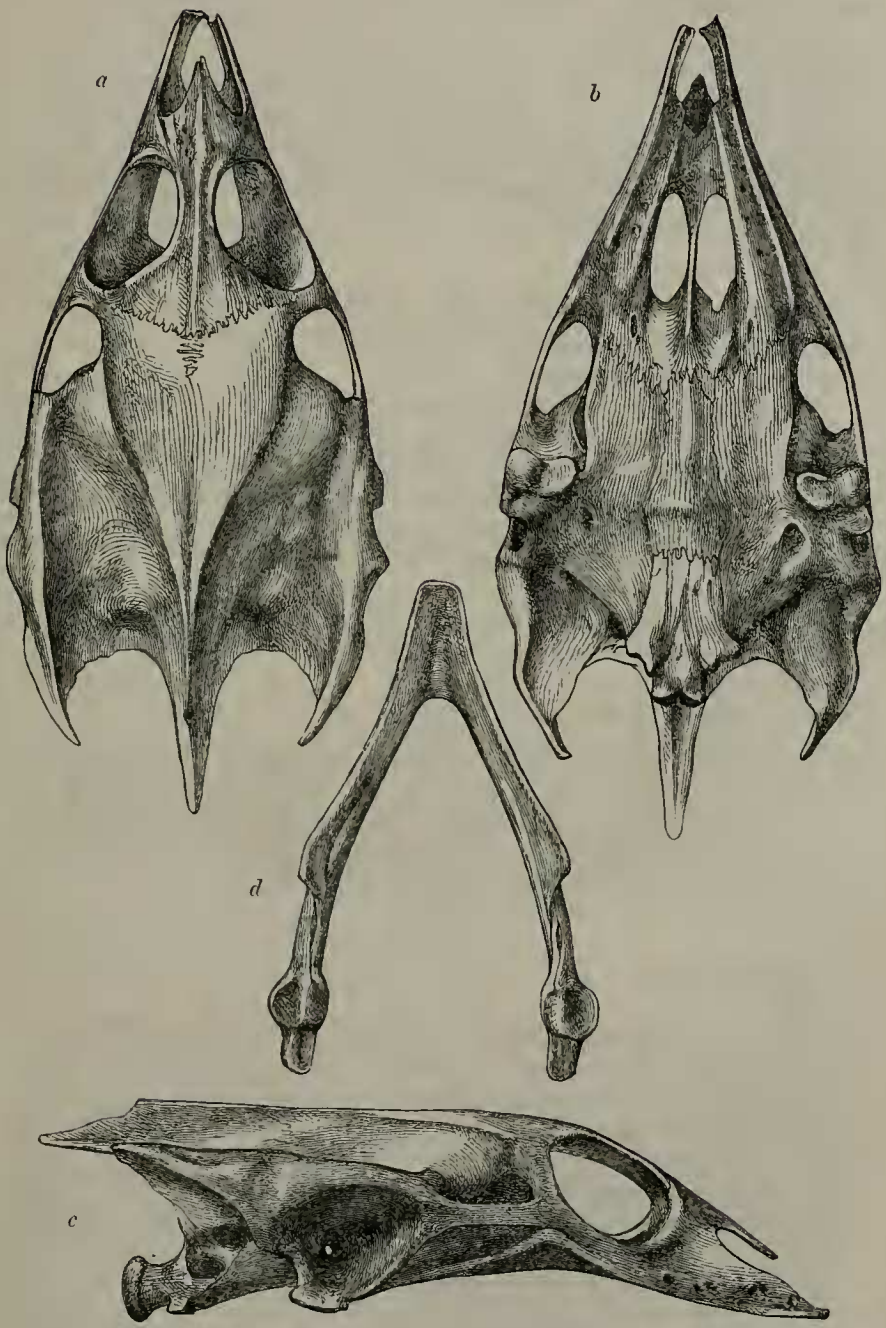
Amyda mutica, Agassiz, Contrib. p. 390, t. 6. figs. 6, 7 (very young); Gray, Suppl. Cat. Sh. Rept. p. 95.

Hab. N. America (*Lesueur*).

11. Tyrse.

Tyrse, Gray, P. Z. S. 1864, p. 87; Suppl. Cat. Sh. Rept. p. 107 (skull); Gray, Cat. Sh. Rept. t. 42. f. 2; Tortoises, Terrapins, and Turtles, tab. (skull and skeleton).

Fig. 11.



Callinia microcephala, enlarged.

Skull elongate; nose conical; the distance from the front of the orbit to the aperture of the nostril about half as long again as the diameter of the orbit; the groove in front of the palate very wide, rather shallow and very much wider behind, so as to include the outside of the internal nostrils.

In the skull of a smaller specimen brought from the Euphrates by Capt. Chesney, the length of the space from the front of the orbit to the aperture of the nostril is much less, not longer than the aperture of the orbit, which is larger for the size of the skull than in the larger Egyptian specimens.

2. Tyrse nilotica.

Head and limbs and shield covered with equal round white spots; chin and throat with larger white spots; beneath white.

Testudo triunguis, Forskal.

Trionyx ægyptiacus, Geoffroy, Ann. Mus. iv. p. 7, tab. (animal, good); Egypt. i. p. 116, t. 1.

Gymnopus ægyptiacus, Dum. et Bibr., Erp. Gén. ii. p. 484.

Trionyx niloticus, Gray, Syn. Rept. p. 46; Cat. Sh. Rept. p. 68, t. 42. f. 2 (skull).

Tyrse nilotica, Gray, Cat. Tort. B. M. p. 48; Suppl. Cat. Sh. Rept. p. 108.

Trionyx labiatus, Bell, Test. tab. (with skeleton).

Aspidonectes aspilus, Cope, Proc. Acad. Nat. Sci. Philad. 1859, p. 205 (adult).

Hab. River Nile.

B. *Dorsal disk with a broad transverse odd bone in front, which is united to the rest of the disk by a straight suture in the adult; lateral bones of the sternum expanded, and covered with well-developed callosities on the whole surface; posterior pair of bones slender, not dilated, without callosities.*

Rafetus.

Rafetus, Gray, P. Z. S. 1864, p. 81; Suppl. Cat. Sh. Rept. i. p. 103.

Skull broad, depressed; nose rounded; nose-cavity square, large; space between the nose and the orbits one third the diameter of the latter; palate rather concave; alveolar surface narrow in front, wider, and with an internal ridge on the sides behind; the groove in front of the palate very wide, rather deep, wider and deeper behind, rather wider than the front edge of the large internal nostrils, and forming a narrow margin to the outer sides of them. Lower jaw with a slightly convex chin; alveolar surface rather broader in front than on the sides, slightly concave, with a very indistinct central longitudinal line exceeding the whole width of the surface; hinder part of the sides narrower, with a longitudinal concavity, and with an elevated inner and more elevated outer edge. Length to occiput $3\frac{1}{2}$ inches; diameter at the front of the temple 2 inches.

The lateral bones of the sternum are entirely covered with callo-

sities, like the *Trionyx*, very unlike the narrow transverse callous band on the edges of the central suture in *Aspilus*. The hinder sternal bones are smooth.

The skull is exceedingly like that of *Trionyx*; but the front of the upper jaw is broader and rounded in front. The distance between the orbit and large quadrangular transverse nose-hole is not half the length of the diameter of the large orbit. The alveolar surface of the upper jaw is moderate, rather narrow in front, and gradually rather broader at the hinder part. The longitudinal depression in front of the inner nostrils is moderately deep, rounded in front, and rather broader behind.

1. Rafetus euphraticus. (Fig. 12, p. 66.)

Testudo rafeht, Oliv. Voy. Pers. ii. p. 453, t. 41 (copied, Shaw's Miscell. t. 2. p. 907).
Testudo euphraticus, Daud. Rept. ii. p. 305 (from Olivier).
Trionyx euphraticus, Geoff. Ann. Mus. iv. p. 17 (from Olivier).
Gymnopus euphraticus, Dum. et Bibr. Erp. Gén. ii. p. 498.
Tyrse rafeht, Gray, Cat. Tort. Brit. Mus. p. 49.
Trionyx rafeht, Gray, Cat. Sh. Rept. Brit. Mus. p. 85, t. 30.
Rafetus euphraticus, Gray, P. Z. S. 1864, p. 81, 1869, p. 213; Suppl. Cat. Sh. Rept. p. 104.
Hab. Euphrates (*Chesney* and *Loftus*); Tigris (*Olivier*).

C. *Dorsal disk truncated in front, with the odd bone separate from it, and with a rounded central callosity in the adult; lateral bones of the sternum expanded, with a narrow linear callosity on each side of the central suture; posterior pair of bones slender, not dilated, without callosities.*

The dorsal disk is truncated or concave on the front edge; the front edge of the first vertebral bone is generally rounded and prominent in front towards the rounded callosity in the middle of the separate front odd bone.

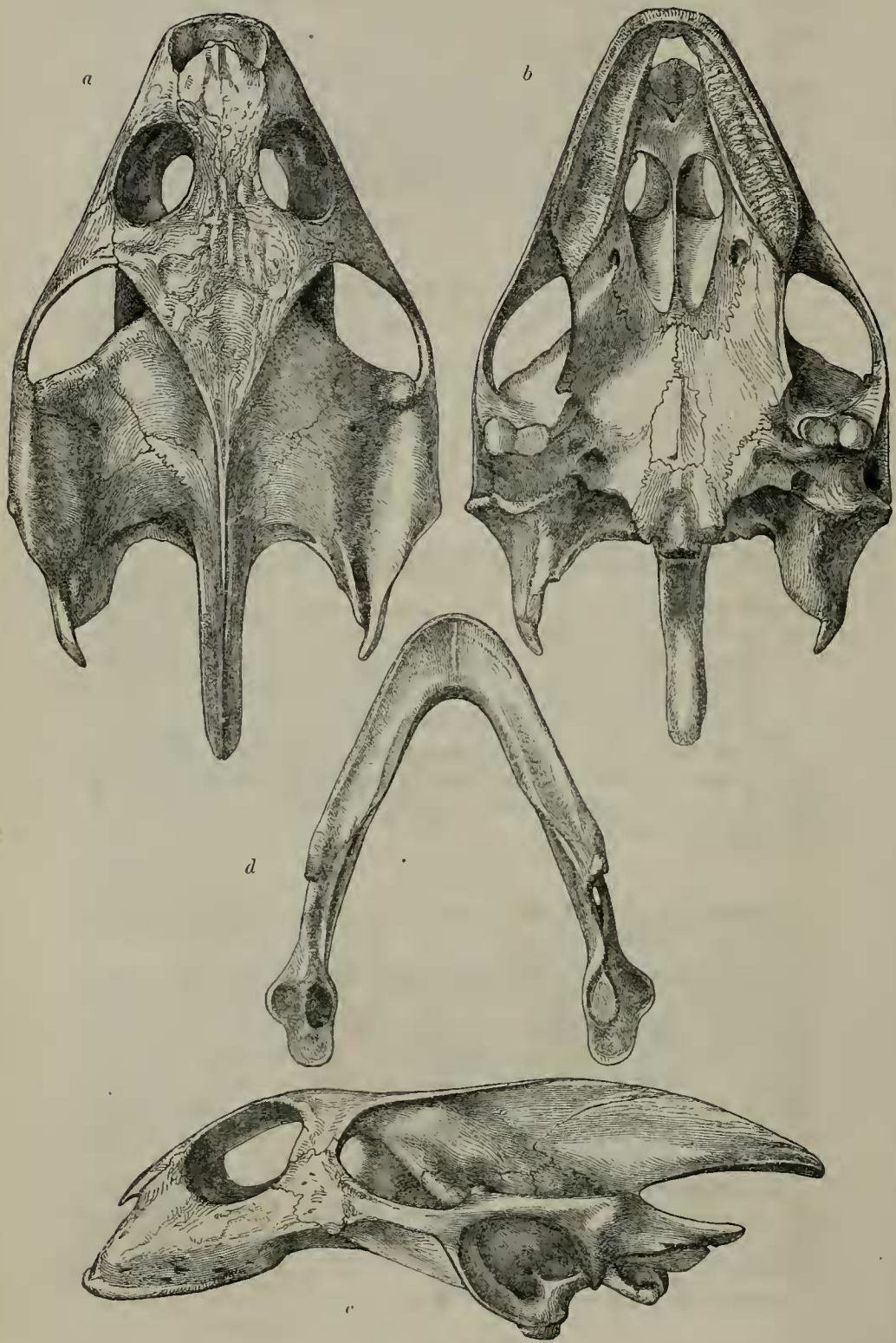
Aspilus.

Aspilus, Gray, P. Z. S. 1864, p. 84, f. 4-6; Suppl. Cat. Sh. Rept. p. 102, f. 33 (skull).

Skull tapering in front; the short space between the square nose-hole and the orbits less than half the diameter of the latter, which are large and rather close; palate broad, rather deep, of the same width the whole length; alveolar process broad behind, gradually narrower in front. Lower jaw with a concave alveolar surface, rather broad in front, with a central longitudinal ridge, more prominent in the centre of its length, and with a somewhat deeper concavity on each side of the ridge.

The young specimens have the odd bone in front of the dorsal disk separate, smooth, and covered with the skin. In the older specimens it becomes nearer to the front edge of the dorsal disk, and has a small circular central callosity.

Fig. 12.



Rafetus euphraticus.

* *Head and forehead with radiating black lines.*

1. Aspilus gataghol. The Gataghol.

Testudo gataghol, B. Hamilton, icon. ined.

Trionyx javanicus, Gray, Illustr. Ind. Zool. tab. (copied from Hamilton).

Aspilus gataghol, Gray, Ann. & Mag. N. Hist. 1873.

Hab. India.

I have never seen a specimen of this species, but describe it on the authority of Dr. Hamilton's drawing.

The black radiations on the head are very like the rays on the head of *T. gangeticus*; but the original drawing and the copy in the 'Illustrations' show only two very narrow lateral callosities, which are characteristic of the genus *Aspilus*.

** *Head white-spotted.*

2. Aspilus javanicus. The Boulousse. (Fig. 13.)

Amyda javanica, Schweigger's MSS., quoted by Geoffroy.

Trionyx javanicus, Trionyx de Java, Geoff., Ann. d. Mus. vol. iv. p. 15, tab. iv. fig. 2.

Trionyx cariniferus, Gray, Cat. Sh. Rept. B. M. p, 67, t. 32 (from spirit).

Aspilus cariniferus, Gray, P. Z. S. 1864, p. 84, figs. 4–6 (skull), 1869, p. 213; Gray, Suppl. Cat. Sh. Rept. p. 101, fig. 33 (skull).

Aspidonectes javanica, Wagler, Amphib. Atlas, tab. 2. figs. 3–13 (fig. 3 copied from Geoffroy).

Gymnopus javanicus, Dumér. et Bibr., Erpét. Gén. ii. p. 493.

Hab. Java.

Fig. 13.

Aspilus javanicus.

Schlegel, in the 'Fauna Japonica' (tab. v. fig. 6), figures the head of a Mud-tortoise under the name *Trionyx stellatus*, var. *javanicus* which is mottled above and below; it probably represents this species.

A specimen in spirits, figured in the Cat. Sh. Rept. t. 30, received from Utrecht, with the dorsal disk about six inches long, does not show any indications of callosities, though it is quite as large as the two dried specimens in the British Museum (one from the same collection), which have these callosities well developed. This genus seems peculiar in having the front margin of the thorax rounded and its sides dilated so as partly to hide the feet when they are withdrawn.

A specimen from the Lao Mountains, collected by M. Mouhot (59, 7, 8, 8), mentioned under *Aspilus ornatus* (Suppl. Cat. Sh. Rept. p. 103), evidently belongs to this species.

Three young specimens from Ceram and Amboina have the callosities not developed. The white spots on the head and the large ones on the throat are so like those of larger specimens from Java in spirits in the British Museum, that I think they will prove to be only a younger state.

There is a young specimen in the British Museum, obtained from Mr. Bartlett, in spirits, the dorsal disk of which is pale brown, with large scattered pale spots, with ridges of lines, which are separated from one another, and larger in the hinder part of the disk.

There is a bleached specimen in spirits received from the Leyden Museum, which is very like a specimen figured in the 'Fauna Japonica.' Dorsal disk about six inches long and wide. It has no indications of the sternal callosities; and the form of the bones is seen through the skin. I think it most likely belongs to this species.

There is a rather smaller bleached specimen in the Museum, in spirits, received from Amboina.

II. Emydina. *The hinder lateral edge of the sternum with flaps to cover the hinder feet; front pair of bones of the sternum with callosities; the front odd bone of the dorsal disk united to the ribs, and sometimes with a small free bone in the margin before it.*

The similarity of the jaws and of the shape of the living *Cyclanosteus* which I had lately an opportunity of examining and figuring from life (P. Z. S. 1870, t. 43), to the animal of *Emyda*, is so great that I think they should be ranged in one group, and the family which I called *Emydidæ*, because the dorsal disk was armed with bones, should be abolished.

Some of the genera also have a rudimentary marginal bone in the front of the disk, as in *Emyda*, which has also posterior marginal bones.

These animals have the odd bone in front of the back united to the ribs in the adult age, so as to form a complete dorsal disk. The genera *Cyclanosteus*, *Emyda*, and *Heptathyra* of the former family have, in addition, a single bone in the centre of the front margin, which is distinct from the front of the odd bone; but the latter often has a notch in the front margin to receive part of it. This bone, I suppose, is a remnant of the marginal bones present in the other

families, like the bones on the hinder margin of the flexible edge of the shield, which is the peculiar character of the Indian genus *Emyda*. This bone is not to be observed in the young specimens of *Tetrathyra* and *Baikiea*.

Synopsis of the Genera.

* *The dorsal disk of adult without any marginal bones on the hinder lateral edge.* Africa.

† *The front and sides of alveolar edge of the lower jaw concave.*

Baikiea. Sternal callosities ——?

†† *Alveolar edge of the lower jaw sharp in front, wider on the sides.*

Tetrathyra. Sternal callosities four—one pair anterior, and one pair lateral.

Cyclanosteus. Sternal callosities nine—two pairs anterior, one pair lateral, one pair posterior, and a single one central.

** *The dorsal disk of adult with a regular series of internal marginal bones on the hinder lateral edge.* India.

Emyda. Sternal callosities seven—a pair anterior, lateral, and posterior, and a single one central.

* *The dorsal disk of adult without any marginal bones on the hinder lateral edge.* Africa.

† *Front and sides of alveolar edge of lower jaw broad, slightly concave.*

Baikiea.

Baikiea, Gray, Suppl. Cat. Sh. Rept. p. 114, fig. 39 (skull).

The alveolar surface of the lower jaw flat, as wide in front as behind; margin of the dorsal disk in the very young specimen without any front central bone, and without any bones behind.

Hab. Africa.

The adult skulls in the British Museum received from Dr. Baikie are about five inches long; they are somewhat like the skulls of *Fordia africana*, but are much blunter and rounded in front.

1. Baikiea elegans.

Cyclanosteus senegalensis (part), Gray, P. Z. S. 1864, p. 96, figs. 19–21 (skull only).

Baikiea elegans, Gray, P. Z. S. 1869, p. 222, t. (young); Suppl. Cat. Sh. Rept. p. 116, fig. 39 (skull).

Hab. Rivers of Western Africa, Dr. Baikie.

The adult state of the shell or bones of this species is not known with certainty, and therefore we cannot describe the sternal callosities; but I received some specimens of shells, with the jaws, which differed from the other specimens of *Cyclanosteus* in the relative size of the sternal callosities of this genus, and in their pro-

portional size as regards each other, which may be the shells of this genus.

In the Supplement Cat. Sh. Rept. p. 113, I thought that the variety with additional sternal callosities (fig. 38) might be a *Baikiea*; but since that time the British Museum has obtained a specimen with its head and limbs, and the examination of the jaws shows it is a true *Cyclanosteus*, and that the adult state of *Baikiea* is still a desideratum.

†† *Alveolar edge of the lower jaw sharp in front, wider and concave on the sides.*

TETRATHYRA.

Tetrathyra, Gray, P. Z. S. 1865, p. 332, fig.; Suppl. Cat. Sh. Rept. p. 110, fig. 36 (sternum).

Sternal callosities four, the lateral pair well developed, the anterior pair small and rounded, on the end of the front pair of bones. Hinder pair of sternal bones, and the odd anterior bone, small and without callosities. The flexible margin of the dorsal disk without any odd central bone in front, or any bones on the hinder margin.

The skeleton of this animal is only known in the young state; perhaps the front odd bone and the posterior bone may have callosities in the adult state.

The lower jaw is narrow and shelving internally in front, with a much wider concave alveolar edge on the side.

1. TETRATHYRA BAIKII.

Tetrathyra baikii, Gray, P. Z. S. 1865, p. 324, fig. of sternum; Ann. & Mag. N. H. 1865, xvi. p. 205, fig.; Suppl. Cat. Sh. Rept. p. 110, fig. 36 (sternum).

Hab. Rivers of Western Africa, Niger? (*Dr. Baikie*).

CYCLANOSTEUS.

Cyclanosteus, Gray, Suppl. Cat. Sh. Rept. p. 111, fig. 37 (skull).

Sternal callosities nine:—two pairs on the front pair of bones, the hinder pair generally the largest; a single semiovate callosity on the front central bone, generally longer than broad; one pair lateral, large, well-developed, deeply notched in the centre of the hinder edge; one pair posterior, on the separate simple posterior bones of the sternum: this pair is sometimes small and rounded, at others larger and ovate, placed obliquely as regards each other. The front part of the lower jaw is narrow and shelving, with a concave much wider alveolar edge on the side. The front bone of the dorsal disk short, broad, and transverse, differing in this respect from the much larger and longer first odd bone in *Heptathyra*. The front flexible margin of the dorsal disk with a well-developed central marginal bone.

1. CYCLANOSTEUS SENEGALENSIS.

Cryptopus senegalensis, Dum. et Bibr., Erpét. Gén. p. 505.

Emyda senegalensis, Gray, Cat. Tort. B. M. p. 47; Cat. Sh. Rept. p. 64; P. Z. S. 1860, p. 316 (junior).

Cyclanosteus (*Cyclanorbis*) *petersii*, Gray, P. Z. S. 1852, p. 135; Ann. & Mag. N. H. 1855, xv. p. 69.

Cyclanosteus petersii, Gray, Cat. Sh. Rept. p. 64, t. 29 (shield); P. Z. S. 1860, p. 315.

Cyclanosteus senegalensis, Gray, P. Z. S. 1864, p. 95, figs. 16–18 (skull); P. Z. S. 1865, p. 427; Suppl. Cat. Sh. Rept. p. 112, fig. 37 (skull), fig. 38 (sternum).

Hab. Rivers of Western Africa; Gambia, Senegal.

The different specimens of this species have the sternal callosities differing in shape and proportion as regards each other.

Thus the specimen figured as *C. petersii*, Cat. Sh. Rept. t. 29 (the skeleton in the Museum), has the central odd callosity half the width of the pair of bones before it, and the hinder pair of callosities small and roundish.

A second specimen in the Museum has the central odd callosity more than two thirds the width of the pair of callosities before it; and the hinder pair of callosities is ovate, nearly the whole length of the bones on which they are situated, and are diverging from each other. This specimen has an additional callosity on the right side of the odd callosity. There is another specimen in the Museum which has this additional callosity on each side of the central callosity (see Suppl. Cat. Sh. Rept. p. 113, fig. 38).

There is a third specimen, which differs in the odd central callosity being transverse and subtriangular, and nearly as broad as the pair of bones before it (see Suppl. Cat. Sh. Rept. p. 113, fig. 38*a*, where these callosities are figured). In this specimen the hinder callosities are entirely wanting or, rather, undeveloped.

** *The dorsal disk with a regular series of marginal bones on the hinder lateral edge, and with a single marginal bone in front, all callous and rugose externally.*—India.

Emyda.

Emyda, Gray, Suppl. Cat. Sh. Rept. p. 117, and fig. 24, p. 105 (skull, as *Pelochelys stellata*); Ann. & Mag. Nat. Hist. 1872, x. p. 340.

Lower jaw with a narrow edge, and shelving internally in front, with a wide concave alveolar edge on the sides.

The dorsal disk with a central bone, callous on the outer side in the middle of the front margin, rather large and separate from but received into a notch in the front edge of the odd bone of the dorsal disk. A regular series of bones, which are callous externally on the hinder lateral margin. Sternum with seven callosities—one pair anterior, one pair lateral, and one pair posterior, and one single central callosity, which is generally of a roundish form.

1. Emyda punctata.

Anal callosities oval, oblique, inner edge of each rounded.

Testudo punctata, Lacép. Qu. O. t. 171.

Testudo scabra, Latr. Rept. i. p. 194.

Testudo dura, B. Hamilton, icon. ined.

Testudo granulata, Daudin, Rept. ii. p. 81, t. 19. f. 2; Shaw, Zool. iii. p. 68, t. 14. f. 1.

Testudo granosa, Schœpf, Test. p. 127, t. 30 *a*, *b*.

Trionyx coromandelicus, Geoffr. Ann. d. Mus. iv. p. 16, t. 5. f. 1.

Trionyx granosus, Schweigg. Prod. p. 208; Wagl. Syst. Amphib. p. 134, t. 2. f. 2, 33; Gray, Illustr. Ind. Zool. ii. t. 64; Schlegel, Faun. Japon. p. 35, t. 5. f. 4 (not Cuvier).

Cryptopus granosus, Dum. et Bibr. Erpét. Gén. ii. p. 501.

Emyda punctata, Gray, Syn. Rept. p. 50; Illustr. Ind. Zool. ii. t. 62 (young); Cat. Tort. B. M. p. 46; P. Z. S. 1855, p. 201; Cat. Sh. Rept. p. 63; Suppl. p. 117; Tort. Terrap. & Turt. t.; Ann. & Mag. N. H. 1872, x. p. 340.

Emyda granosa, Theobald, Journ. Linn. Soc. 1868, x. p. 18.

Emyda vittata, Peters, Monatsb. 1854, p. 216.

Emyda scutata, Peters, Monatsb. 1868, p. 440; Gray, Suppl. Cat. Sh. Rept. p. 117.

Potamochelys stellata, Gray, P. Z. S. 1864, p. 85, figs. 7 & 8 (skull only); Suppl. Cat. Sh. Rept. p. 105, f. 34 (skull only).

General Hardwicke figures a spotted example of this species from life, which is copied as *T. punctata*, junior, Gray, Illustr. Ind. Zool. tab. His drawings also contain the figure of a much larger specimen from Futtehghur, which he says is "Bungoma," the country name for the land Tortoise commonly called Terrapin. Back uniformly olive-green, upper part of head, neck, and limbs green, with two pale orange spots on each side of the crown of the head. Lower side with sternal callosities well developed. These figures are copied in my Illustr. Ind. Zool. under the name of *Trionyx granosus*.

It seems to be a very generally distributed animal in all parts of India; and the size of the tubercular plates on the sternum increases and alters in shape with age; and the Tortoise varies considerably in colour, both from age and also, perhaps, from other causes.

2. Emyda ceylonensis.

Caudal callosities angular, parallel; inner edge straight.

Trionyx granosus, Cuvier, Oss. Foss. v. p. 206, t. 12. f. 47.

Emyda ceylonensis, Gray, Cat. Sh. Rept. p. 64, t. 29*a*; P. Z. S. 1855, p. 201, 1864, p. 98; Suppl. Cat. Sh. Rept. p. 117.

Hab. Ceylon.

Dr. Peters, in the Monatsb. 1854, p. 216, describes an *Emyda vittata*, and in 1868, p. 440, of the same work, describes an *Emyda scutata*. I had thought that the former was the same as my *Emyda ceylonensis*; but in a letter which Dr. Peters wrote to me (on the 26th February, 1871), he observes, "my *Emyda vittata* is quite different from *Emyda ceylonensis*, having the abdominal plates much smaller, and being in this respect more like *Emyda punctata*. My *E. scutata*, on the contrary, more resembles *E. ceylonensis*."

Dr. Kelaart describes the Ceylonese species as marked with indistinct brown stripes on the back and head, characters which Dr. Peters gave to *E. vittata*.